

AUTUMN FAUNA OF COLLEMBOLA FROM CENTRAL CRETE¹⁾

by

WILLEM N. ELLIS

Instituut voor Taxonomische Zoölogie (Zoölogisch Museum), Amsterdam

With 46 text-figures

ABSTRACT

A systematic and faunistic account of the Collembola occurring in central Crete is presented. All material was collected in the second half of October, 1972, by various techniques, including portable Berlese funnels. In all, 93 species are recognized. Of these, 15 represent new taxa: the new species *Mesaphorura critica*, *Onychiurus xenonis*, *Acheroxenylla cretensis*, *Hypogastrura tethyca*, *Xenyllodes minitaurus*, *Pseudachorutes (Pratanurida) mucronata*, *Neanura cretensis*, *Lathriopyga anthrenoidea*, *Cryptopygus triglenus*, *Clavisotoma albertinae*, *Dimorphotoma porcellus*, *Troglopedetes cretensis*, and *Pseudosinella paprivata*, and two new subspecies *Odontella nana orientalis* and *Sminthurinus alpinus bisetosus*. The new genus *Acheroxenylla* (monotypic for *A. cretensis* n. sp.) closely resembles *Xenylla* but has only 2+2 ocelli. *Heteromurus sexoculatus* Brown, 1926, and *Seira graeca* Ellis, 1966, are revalidated. *Onychiurus sublatus* Gisin, 1957, *O. gisini* Haybach, 1960, are synonymized with *O. prolatus* Gisin, 1956, as well as the two subspecies *O. p. conlatus* Gisin, 1962, and *O. p. trilatus* Gisin, 1963. A key is given to recently described species of *Mesaphorura*, and the better-known European *Seira*. Critical discussions of many species are included, and mass occurrences of *Clavisotoma albertinae* and *Dimorphotoma porcellus* are reported.

INTRODUCTION

Although Crete has received much attention from collectors, its collembolan fauna has been completely neglected. To make a start on the faunistic and systematic exploration of the springtail fauna of this splendid island, the author and his wife made a collecting trip between Oct. 14th and Oct. 30th in 1972. Since we had our base in Iráklion, mainly this region was sampled. This is the lowest, and possibly not the most interesting part of the island, and extensive collecting in the mountains is still urgent. Nevertheless, an interesting fauna was found.

The time of collecting coincided with the transition from the summer drought to the autumn rains; this is the short season when geophytes produce their leaves, and annuals germinate, twining the landscape from brownish-yellow to green within a couple of weeks. All of the collected material is treated here, and all specimens are kept (mostly on slides, mounted separately in Marc André II unless otherwise mentioned) in the collections of the Zoölogisch Museum, Amsterdam.

The material was collected manually, with the sweeping net, or more usually with a set of portable Berlese funnels based on the model advocated by J. T.

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Salmon. Unless specified otherwise, all collecting sites were at altitudes of less than 400 m above sea-level. To avoid undue length, the list of references is in general restricted to descriptions published since the appearance of Salmon's Index to the Collembola (1964).

This is my third contribution to the study of the Greek fauna (the first, on two species from the mainland, was published as early as 1966, the second, concerning the fauna of Rhodes, appeared in 1974). Since more are planned, zoogeographical and ecological discussions are kept to a minimum in the present paper. These subjects will receive the attention they deserve after the fauna of more localities has been treated.

Again, help without which this paper could not have been completed was generously given by colleagues, among whom special mention should be made of J.-M. Betsch (Brunoy), R. Dallai (Siena), P. N. Lawrence (London), P. F. Bellinger (Northridge, California), Z. Massoud (Brunoy), A. Szeptycki (Kraków), and R. Yosii (Kyoto). The assistance of our technician, L. B. Panday, and our secretaries T. Dovale and E. C. Gräper is gratefully acknowledged. Prof. J. H. Stock and Prof. J. T. Wiebes are sincerely thanked for their critical reading of the manuscript.

List of samples

1. Kríti, Thérissos, 14.x.1972, (ca. 5 km W. of Iráklion), upper 5 cm of rather dry, comparatively loose loam covered by *Capparis* spec., on slope along street; author's collection number 972.215.
2. Tsagarák (a village 17 km S of Iráklion, along the Giófiros River), 15.x.1972, crumbly, dry loam, sampled at a depth of 10 cm in an olive grove without undergrowth; 972.217.
3. Tsagarák, litter and topsoil (small hard lumps of dry loam) under an isolated *Quercus coccifera* L. in phrygana (i.e., a very common low vegetation type, comparable to the French garigue, consisting mainly of small shrubs and geophytes); 972.234.
4. Festós, 16.x.1972, rather damp, crumbly loam in trodden meadow on small island in the Geropótamos River; 972.197.
5. Festós, rather dry crumbly loam with many roots and many stones in small bush along Geropótamos, consisting of *Vitis*, *Punica*, and *Ficus* with little undergrowth of geophytes; 972.227.
6. Festós, along Geropótamos: loose soil and root-mat of an opulent vegetation comprising various herbs and tall grasses (ca. 60 cm) with a somewhat ruderal appearance; 972.239.
7. Festós, along Geropótamos; trodden, compact, rather moist loam with many pebbles, under a low vegetation, mainly clover; 972.236.
8. Festós, along Geropótamos: swept from low grass of meadow; 972.213.
9. Fortétssa (about 5 km SE of Iráklion), 18.x.1972, after two days of heavy rain, wet swollen loam of vineyard; 972.224.
10. Fortétssa, wet sandy loam, trodden and ruderal, with some perennial grasses; 972.230.

11. Fortétsa, moist compact loam under large almond tree in fallow field; many goat droppings; 972.208.
12. Ioúchtas, a hill near Archánes, 10 km SSW of Iráklion, 19.x.1972, 620 m, loose warm-brown terra rossa under low bushes in phrygana, west exposition; 972.240.
13. Ioúchtas, 700 m, loose terra rossa half under *Quercus coccifera* on yoke of the hill; 972.221.
14. Ioúchtas, 760 m, loose terra rossa in phrygana on west exposition; 972.229.
15. Ioúchtas, 600-700 m, swept from bushes (mainly *Pistacia lentiscus* L.); 972.210.
16. Amnisós, 5 km E of Iráklion, 20.x.1972, stony yellowish compact loam under *Sarcopoterium* bush in degraded phrygana on weak east slope; 972.238.
17. Amnisós, rather dry, loose, humus-rich sand on 3 m high cliff, along the sea, under shabby herbaceous vegetation; 972.241.
18. Amnisós, loose loam at north foot of a hedge of *Arundo donax* L. (a tall grass, 2-4 m high) along field, 972.198.
19. Agía Varvára, 21.x.1972, 700 m, pleurocarpous mosses and *Selaginella denticulata* (L.) Link, on short, almost vertical slope, northwest exposition, in phrygana; 972.199.
20. Agía Varvára, 750 m, humus-rich very stony loam with a scanty grass and *Juncus* vegetation; the spot seems to be a spring in the spring season; 972.228.
21. Agía Varvára, 750 m, opulent cushion of pleurocarpous moss on north bank of dry rivulet in degraded phrygana; 972.223.
22. Agía Varvára, 600 m, swept from low bushes (*Sarcopoterium*) in phrygana; 972.203.
23. Réthimnon, 22.x.1972, verge of a road near the city, comparatively damp, heightened rather recently with coarse (beach-?) sand, overgrown with scanty grass; 972.225.
24. Réthimnon, comparatively damp plastic yellow loam at the foot of an earthen wall about 2 m high across a field, north exposition; 972.216.
25. Drosiá, between Iráklion and Pérama, about 15 km E of the latter, 23.x.1972, crumbly loam, abundant mosses and litter under large *Quercus coccifera*, at base of north side of an east-west running ravine; 972.212.
26. Drosiá, upper 2 cm of bare compact loam, with a thin carpet of ephemeral liverworts (*Riccia*, *Fossombronia*, *Targionia*) in strongly degraded phrygana on south wall of the same ravine as 25; 972.243.
27. Drosiá, litter under large *Quercus coccifera* on south slope; 972.226.
28. Drosiá, large isotomid, walking in large numbers freely on stones, soil, etc., on south slope, collected manually; 972.214.
29. Knossós, vicinity of the excavations, 24.x.1972, crumbly yellow loam, rarely trodden, under large peach tree on north slope of brook near the "guest-house" (Xénon), undergrowth mainly *Oxalis pes-caprae* L.; 972.242.
30. Knossós, loose loam, sparsely grown with grass and *Oxalis pes-caprae* at foot of a 4 m-high cliff along road; 972.219.
31. Knossós, collected manually under stones, pieces of dead wood, etc.; 972.195.
32. Iráklion, 25.x.1972, after heavy rains, loam, litter and rotting leaf bases under vigorous ruderal vegetation (*Ecballium elaterium* (L.) Rich.); 972.233.

33. Iráklion, loam of ruderal field, overgrown mainly with grass and *Carpobothrus* along road; 972.232.
34. Iráklion, bank of loam overgrown with strongly ruderal vegetation; 972.244.
35. Máraithos, 15 km W of Iráklion, 26.x.1972, litter under *Pistacia lentiscus* in phrygana on weak north slope; 972.209.
36. Máraithos, upper 2 cm compact bare loam, with ephemorous vegetation of liverworts (*Fossombronina*) and seedlings, along roadside; 972.231.
37. Máraithos, litter under large *Ceratonia siliqua* L. in field; 972.237.
38. Máraithos, collected manually from stones and pieces of wood, and swept from *Pistacia lentiscus*; a *Seira* on an olive trunk; 972.196.
39. Máraithos, large extremely numerous isotomids, walking on stones and on bare soil; 972.204.
40. Amnisós, 27.x.1972, upper cm loam along beach, with very spare vegetation of *Salicornia fruticosa* (L.) L., some annual mosses (*Bryum* spec.), near *Tamarix* bush; 972.200.
41. Amnisós, loamy sand of fallow field with a mat of *Malva* spec.; 972.235.
42. Gázi, 7 km W of Iráklion, 28.x.1972, loamy clay under *Ecballium* in fallow field 500 m from the shore; 972.206.
43. Mália, 29.x.1972, brown, crumbly, stony loam grown with a poor grass vegetation under large *Ceratonia* tree; 972.205.
44. Mália, litter of *Quercus coccifera* in well-developed phrygana; 972.211.
45. Mália, terra rossa, acrocarpous mosses and *Selaginella* deep in a rock-fissure at foot of north slope of ravine; 972.222.
46. Mália, collected manually under stones in phrygana; 972.201.
47. Agía Galíni, 14 km NW of Festós, 30.x.1972, beach sand and *Posidonia* (a kind of sea grass) debris in a layer of about 2 cm; 972.218.
48. Agía Galíni, *Tamarix* litter and fine sand, overgrown with *Malva* and *Oxalis pes-caprae* just above the beach; 972.207.
49. Agía Galíni, yellowish-brown loam of lucerne field; 972.220.
50. Agía Galíni, collected manually, under large pebbles on the beach; 972.202.

Table 1. Greek orthography and transcription of the locality names used

Κρήτη	Kriti	Ἀμνισός	Amnisós
Θέρισος	Thérisos	Ἀγία Βαρβάρα	Agía Varvára
Τσαγαράκ	Tsagarák	Ρέθυμνον	Réthimnon
Ἡράκλειον	Iráklion	Δροσιά	Drosiá
Γιόφυρος	Giófiros	Πέραμα	Pérama
Φεστός	Festós (in Times Atlas Phaistos)	Κνωσός	Knossós
Γερω-Πόταμος	Geropótamos	Μάraithος	Máraithos
Φορτέτσα	Fortétsa	Γάζιον	Gázi
Ιούχτας	Iouchtas	Μάλια	Mália
Ἀρχάνες	Archánes	Ἀγία Γαλήνη	Agía Galíni

ACCOUNT OF THE SPECIES

ONYCHIURIDAE

***Metaphorura affinis* (Börner, 1902) (Fig. 1)**

Material: see table 2.

Discussion. The rather extensive material of this common European species that I could study is strongly heterogenous in some characters of the apex of the abdomen. The material can be separated into two forms, A and C, connected by a few intermediate specimens I shall refer to as B. For the number and distribution of these forms, see Table 2.

The forms can be segregated as follows. Specimens of form A have the dorsal granulation on abd₃ so strongly developed that the secondary granulations touch each other, giving a roughly hexagonal outline (Fig. 1d). Between the macrochaetae p₂ on abd₃, ten such coarse granules are present. The granules also have a distinctly flattened apex, as can be seen in profile. The same type of integumentary ornamentation is visible on the dorsal surface of head, thorax, and abd₁₋₄. On abd₆ the granules are not flattened or hexagonal, but more or less globular. Laterodorsally, abd₆ shows an area where these granules are grossly enlarged (Fig. 1c). Furthermore, specimens of this type invariably have the sensilla s on abd₃ very short — in fact, reaching only to about the middle of the pseudocellus of abd₃ (Fig. 1b, c). Finally, the anal spines are slightly heavier and more strongly yellow-tinted than those in the types B and C.

Specimens of type C have the integumentary granulation rather fine and regular, the granulations not touching each other and having a globular profile. Only the granulation of abd₆ is much coarser, but the two areas with strongly swollen granula are absent. Moreover, seta s on abd₃ is distinctly longer, reaching well beyond the posterior margin of the corresponding pseudocellus (Fig. 1a). As mentioned above, the anal spines seem to be more slender and paler. About 17-18 granulations are present between the p₂ on abd₃.

The intermediate type B has the granulations enlarged, though not so strongly

Table 2. Distribution of types A, B, and C within the samples of *Metaphorura affinis*

A	B	C	sample nr.	locality
2 ♀, 1 ♂, 1 juv.			5	Festós
1 ♀, 2 ♂, 1 juv.			6	Festós
1 ♀, 1 juv.		1 juv.	24	Réthimnon
1 ♀, 1 juv.			48	Agía Galíni
5 ♀, 1 ♂			49	Agía Galíni
1 ♀, 2 juv.			30	Knossós
	3 ♀		29	Knossós
	1 ♀		16	Amnisós
		1 juv.	9	Fortétsa
		1 ♀	14	Iouúchtas
		2 ♀, 2 juv.	20	Agía Varvára
		3 ♀, 1 ♂, 1 juv.	45	Mália

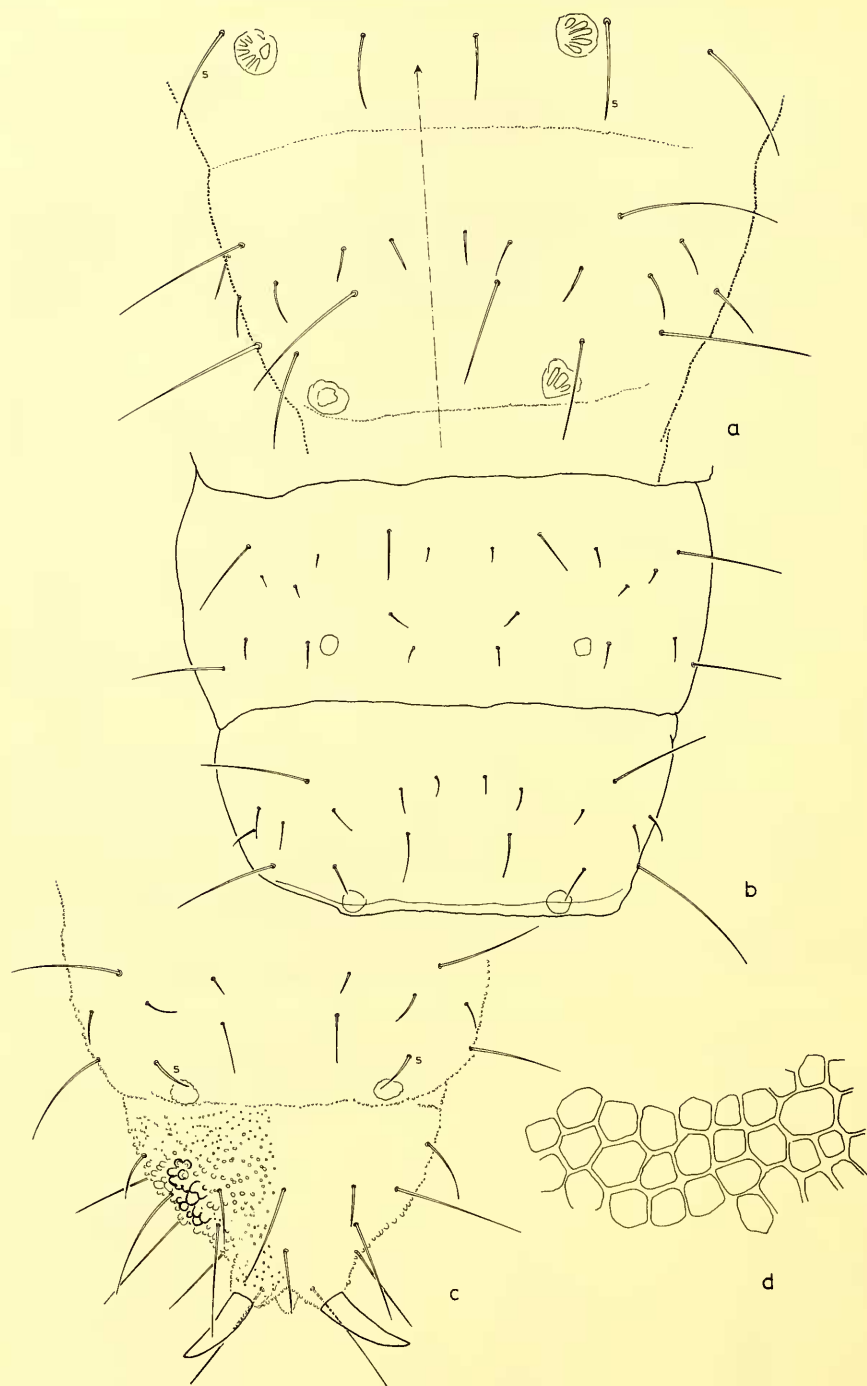


Fig. 1. *Metaphorura affinis* (Börner). a, abd₅ of type C ♀; b, abd₄₋₅ of type A ♀; c, abd₅₋₆ of type A ♀ (on abd₅ setae a₁ omitted); d, hexagonal arrangement of secondary granulations between p₂-p₂ on abd₅ of type A ♀ (very strong magnification)

as in type A (between the p_2 on abd_5 there are about 12 granulations), and they are only slightly hexagonal in outline and flattened at the top. On abd_6 the strongly enlarged lateral granulations are completely or almost absent. Seta s on abd_5 is just as short as in type A. Evidently, type B is much closer to type A than to type C, and it could be argued that A and B should be united.

Börner (1902) described his *Tullbergia affinis* from many specimens from Sicily and Calabria, and called the integumentary reticulation „fein und gleichmässig, nur auf dem Kopfe ein klein wenig kräftiger“. His material thus seems to agree with my form C.

I have checked the other material of this species in our collection. Material from Iceland, Sweden, Austria, and the ČSSR proved to be referable to form B; material from Yugoslavia, as well as the specimens recorded by me from Rhodes, are identifiable as belonging to C.

As far as I know, form A, which seems to deviate the most from typical *affinis*, cannot be correlated with any species description. The drawing made by Handschin (1929) of abd_6 of his *Tullbergia bipartita* shows a perfectly simple granulation, only compatible with type C.

Cassagnau (1963) described a comparable diversity in granulation in material of *M. bipartita* (Handschin, 1920) from North Africa: some specimens, considered to be aberrants, showed a remarkably coarse granulation (consisting of rounded papillae) all over the body (also the ventral face?), whereas abd_6 bore the two types of enlarged granulations described above. Moreover, the unpaired, conical organ on abd_6 was reduced to at most a vague boss. The last observation differs widely from what I found in Cretan material, where the unpaired cone is well-developed in all forms.

I admit that the complex situation described above could be explained by assuming the presence of two species, *affinis* and *bipartita*, in the present material. But I did not succeed in discerning the particular bilobation in the elements of the postantennal organ said to be characteristic for *bipartita*; I even wonder whether these structures are visible at all with light microscopy, and I am inclined to share Gisin's (1944) opinion that the two taxa are synonymous.

As is evident from Table 2, the three types cannot be simply related to sex or maturity. However, since some very young specimens have seta s strongly developed on abd_5 and a reticulation of type C, it is possible that type A concerns specimens that are not only sexually mature but also completely full-grown.

Cassagnau (l.c.) brought the described phenomena into tentative correspondence with ecomorphosis. This possibility merits closer consideration, although the seemingly normal fat body, the full intestine, and the apparent sexual maturity of many specimens of form A all argue the contrary. However, this suspicion and the fact that intermediate forms between the extremes occur in Crete and elsewhere, make it impossible, at present, to attribute specific status to types A and C. Their virtually sympatric occurrence within Crete is sufficient reason not to create subspecies.

One female from sample 29 is aberrant in that it completely lacks the anal spines. The median process is present however.

Metaphorura spec. (Fig. 2)

Material: one immature specimen from sample 30.

Discussion. The single specimen, measuring 0.6 mm, is so immature that no trace of a genital orifice is visible. It is very unfortunate that more and better material is not at hand, since the specimen shows some interesting features.

The 6th abdominal segment has 2+2 spines, and therefore identification as a *Stenaphorura* seems appropriate (Fig. 2a). The relatively small postantennal organ, with a small number of elements (Fig. 2b), the structure of ant₄, and the pseudocellar formula 11/122/22221 point toward identity with *Tullbergia* (*Stenaphorura*) *gisini* Selga, 1963, described from the Sierra de Guadarrama. Seemingly, the chaetotaxy of the Greek specimen is in good agreement with the Spanish material. However, there are the following important differences:

- (i) the Greek specimen has an unguiculus (of about 1/3 unguis);
- (ii) the accessory sensilla in antennal organ III is lacking;
- (iii) the ant. org. III is covered by three high, thin skin flaps (Fig. 2 c);
- (iv) the postantennal organ is simple in outline;
- (v) the apex of abd₆ bears a tubercle which is completely comparable to that of *Metaphorura* (though slightly lower than is usual in *M. affinis* which in this respect is notoriously variable).

A median tubercle as in *Metaphorura* is described by Gisin (1963a) in his *Tullbergia novemspina* from Yugoslavia; judging from the figures given by Gisin, however, this species differs not only by having 4+4 lateral spines on abd₆, but also by a very different chaetotaxy of abd₅.

Neotullbergia tricuspis (Börner, 1902)

Tullbergia ramicuspis Gisin, 1953, 1960, Dallai, 1973 (nec *T. tricuspis*: Gisin, 1944, 1960).

Material: 1 ♀ from sample 24.

Discussion. The species has been recorded from central and southern Europe (Spain, Italy, France, Yugoslavia). The single specimen from Crete agrees well with the description of *ramicuspis* by Gisin (1953), but the anal spines may be a bit more slender.

The complicated synonymy of this species has been clarified by Hüther (1961). However, another problem of synonymy still has to be settled. Bonet (1944) recognized in *Lipura pusilla* Giard, 1895 (description corrected in Giard, 1896; note also that Bonet mentions wrong publication dates) a *Neotullbergia*. He was not able to locate this species, but among material from Chili Rapoport & Rubio (1963) found a species that fitted Giard's description. These authors overlooked Giard's remark that he knew *L. pusilla* not only from material from Chili but also from Cape Gris Nez in NW France. This fact, the scanty description, and the small size (0.6 mm) of *pusilla*, all favour the supposition that *pusilla* might be, at least partially, immature *tricuspis*. To preclude the annoying complications that would result, I herewith restrict the type locality of Giard's species to Santa Rita, Chili.

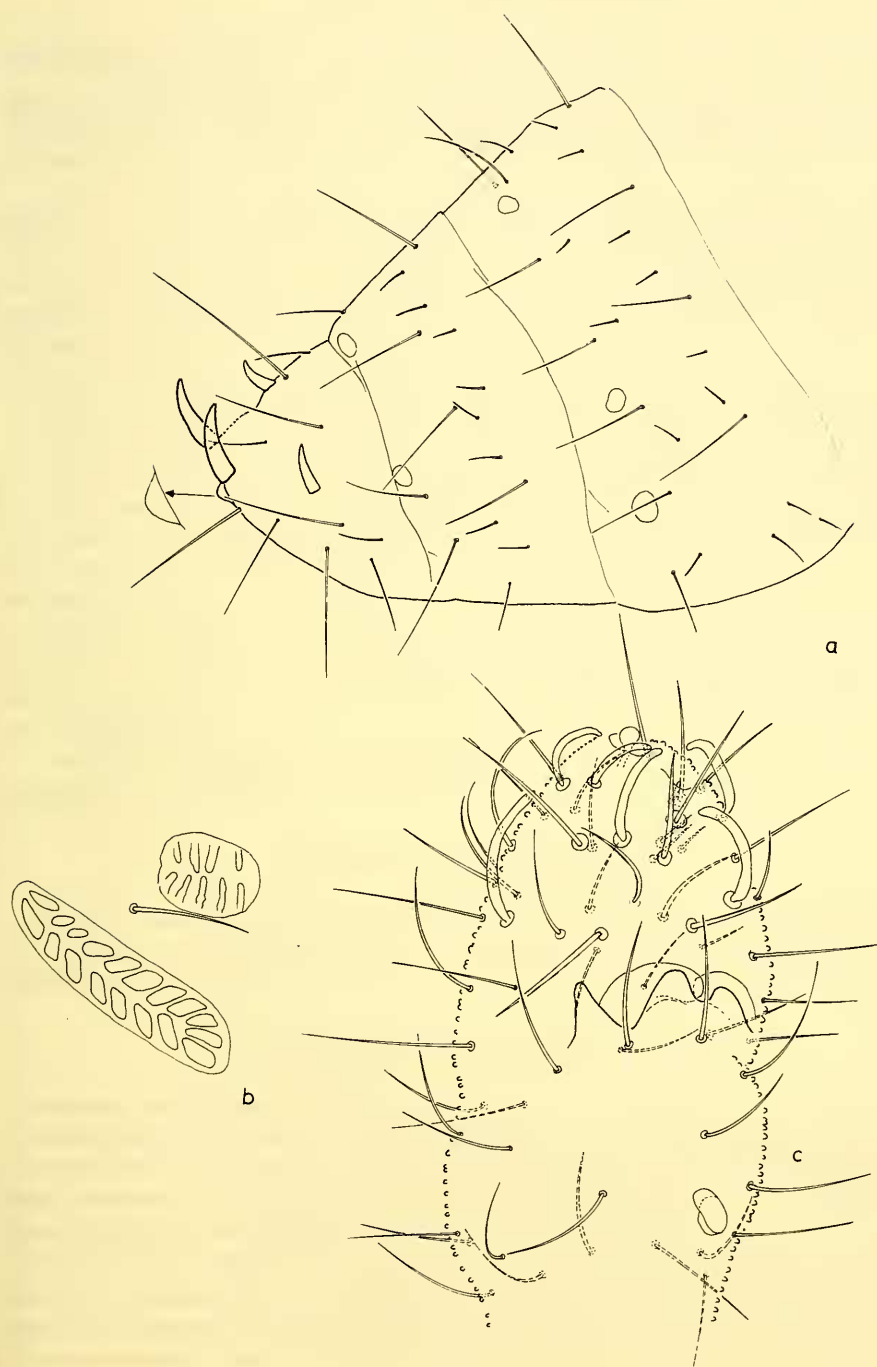


Fig. 2. *Metaphorura spec.* a, abd₄₋₆; b, postantennal organ and neighbouring pseudocellus; c, antenna₃₋₄

Mesaphorura critica n. sp. (Fig. 3)

Material: sample 6: 1 ♀; 20: 6 ♀; 23: 1 ♀; 24: 5 ♀ and 2 juv.; 25: 3 ♀ and 2 juv.; 27: 1 ♀; 33: 1 ♀; 49: 2 ♀. The ♀ from sample 23 is selected as holotype.

Description. Habitus as usual in the genus; total length about 0.4 mm. Granulation fine and regular, a bit coarser on abd₆.

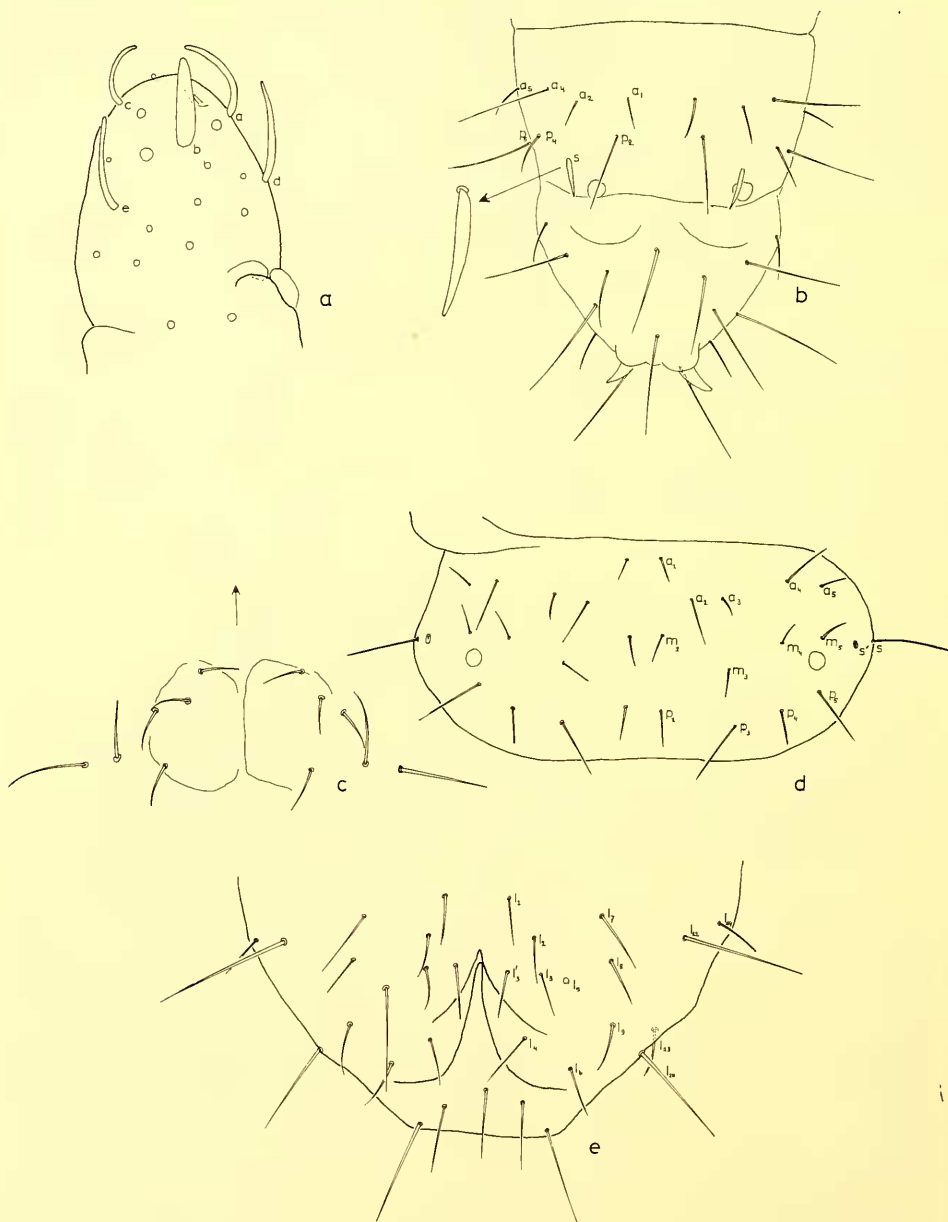


Fig. 3. *Mesaphorura critica* n. sp. a, ant₄; b, abd₅₋₆; c, ventral tube; d, th₃; e, chaetotaxy of anal region

Chaetotaxy: th_1 : m_{1-4} ; th_2 : a_{1-5} , m_1 , m_{3-5} , s' , s , p_1 , p_{3-5} ; th_3 : as th_2 (Fig. 3d); abd_1 : a_{1-5} , m_4 , p_{1-5} ; abd_2 idem; abd_3 idem; abd_4 : a_{1-4} , m_4 , p_{1-5} ; abd_5 : a_1 , a_{3-5} , p_2 , s , p_{4-5} . Distinct macrochaetae on abd_4 are a_2 and p_2 , on abd_5 a_4 and p_2 . Anal flaps without setae l'_2 (Fig. 3e).

Rosette-shaped pseudocelli distributed as 11/011/10011; those on th_2 and th_3 are situated between setae m_5 and p_5 .

Antennae with the normal sensory complement. Sensilla b thick (Fig. 3a). Ant: head \varnothing = ca. 0.65. Postantennal organ about 1.5-2 times pseudocellus. Labium with 4+4 setae. On th_{2-3} the "Lateralsensille" s, distinguished by Rusek (1971b) not differentiated from a normal hair; sensillae s' present on these segments. Sensilla s on abd_5 swollen, 9.8 μ (for comparison: the length of seta p_2 on this segment is 16 μ).

Claw toothless, 8.5 μ , unguiculus needle-like, 3 μ .

Semicircular ridges on abd_6 evident, anal spines 6 μ , curved (Fig. 3b).

Ventral tube with 4+4 apical setae, 1 laterobasal, and 1 lateral seta (Fig. 3c).

Discussion. The material under consideration is exactly intermediate between *M. italica* and *M. sylvatica*, both described by Rusek (1971) from Italy, the ČSSR, and Bulgaria. The material is identical to *M. italica*, except for the lack of seta a_2 on abd_5 ; otherwise it is identical to *M. sylvatica*, but the pseudocellus on th_3 is situated between setae m_5 and p_5 .

The above situation might either be interpreted as an indication of synonymy of *italica* and *sylvatica* or necessitate the description of a new species. The perfect uniformity of all specimens studied from Crete finally persuaded me to choose the second alternative.

The specific name refers to the ambiguous state of the new species, alluding at the same time to the Greek name Kriti.

Mesaphorura italica (Rusek, 1971)

Material: sample 11: 1 juv.; 17: 4 ♀; 23: 1 ♀; 24: 1 ♀; 25: 3 ♀; 30: 1 ♀; 35: 1 ♀.

The material is in full agreement with Rusek's detailed description. The species was subsequently recorded by Rusek (1973b: Italy) and by Ellis (1974: Rhodes).

Mesaphorura krausbaueri Börner, 1901

Material: sample 40: 11 ♀ and 2 ♂; 43: 1 ♀.

Description. The material differs consistently from the description given by Rusek (1971) in one respect: in all specimens studied seta l'_2 is present on the anal flaps. However, this is not only the case in Greek material: a casual study of some Dutch specimens showed that this seta is also present there.

Since the delimitation of this species has been drastically narrowed by Rusek's work, it is impossible to say much about its geographical distribution. As conceived of at present, it is known from the ČSSR, Italy, the Netherlands, and Crete. The occurrence of males in the Cretan material is noteworthy.

To synthesize the knowledge of the *krausbaueri* group, I constructed the following, simple key to the species.

Key to the species of the *Mesaphorura krausbaueri* group

1. abd₅ in frontal row with 1 + 1 microchaetae between bordering macrochaeta (a₂ in this case) *hygrophila* (Rusek, 1971)
 - 2 + 2 microchaetae between bordering macrochaeta a₄ 2
 - 3 + 3 microchaetae between bordering macrochaeta a₄ 3
2. pseudocellus on th₃ behind or between p₃ and p₄ *sylvatica* (Rusek, 1971)
 - this pseudocellus between m₅ and p₅ *critica* n. sp.
3. th₃ with 2 + 2 pseudocelli 4
 - th₃ with 1 + 1 pseudocelli 5
4. all sensillae strongly developed; in particular sensilla b on ant₄ inflated *sensibilis* Rusek, 1973
 - most sensillae slender; sensilla b on ant₄ thin *tenuisensillata* Rusek, 1974
5. pseudocelli on th₂₋₃ situated between m₅ and p₅ *italica* (Rusek, 1971)
 - these pseudocelli between or behind p₃ and p₄ 6
6. on abd₄ p₁ is a macro-, p₂ a microchaeta *krausbaueri* Börner, 1901
 - on this segment p₁ is a micro-, p₂ a macrochaeta *yosiii* (Rusek, 1967)

Protaphorura prolata (Gisin, 1956)

Onychiurus prolatus Gisin, 1956.

O. sublatus Gisin, 1957. — nov. syn.

O. gisini Haybach, 1960. — nov. syn.

O. prolatus conlatus Gisin, 1962. — nov. syn.

O. prolatus trilatus Gisin, 1963b. — nov. syn.

Material: sample 9: 4 ♀ and 1 ♂; 18: 8 ♀ and 10 ♂; 20: 1 juv.; 21: 1 ♂ and 1 juv.; 24: 9 ♀, 11 ♂ and 12 juv.; 30: 8 juv.; 31: 1 ♀; 32: 6 ♀ + 36 ex. in alcohol; 34: 5 ♀, 3 ♂ and 1 juv.; 36: 1 ♂ and 1 juv.; 37: 12 ♀ and 3 ♂; 38: 6 ♀, 7 ♂ and 12 juv.; 44: 1 juv.

Discussion. The extensive material (in all 125 specimens) is very homogenous, and variation is not much greater between samples than within samples. The largest specimens measure 1.8 mm, but adult specimens are normally 1.3 mm long.

The dorsal pseudocellar arrangement was found to be very constant, viz., 33/022/33343. In fact, not a single deviation from this formula was noted. The lack of a tooth on the unguis is also constant. Absence of seta m on th₁ was doubtful only once (it did occur in one adult specimen, and only asymmetrically). Seta i is sometimes missing, especially in immature material. Much more variable is the number of microchaetae in hind row of th₁. Rather often, only two were found (although almost always asymmetrically, the higher number being present on the other half of the segment). At the base of the ventral tube, 2 + 2 setae are usually present, but an arrangement 1 + 1 occurs relatively frequently. Abd₅ invariably lacks seta s'.

The shape of the anal spines, in itself difficult to assess exactly, is rather variable, ranging from rather stout to rather slender. The arrangement of the

four prespinal setae on abd_6 cannot be regarded as a useful character, gradual transitions being demonstrable between almost parallel and forming a blunt angle.

The M/s ratio on abd_5 (following Gisin's convention, in which the length of the anal spines is set at 10) is variable. Some random measurements, all made in adult specimens, are: sample 9: 12/7; sample 18: 11/6, 11/6, 12/6, 12/6, 13/6; sample 32: 24/11; sample 34: 18/10; sample 37: 18/11; sample 44: 18/12, 20/12, 20/10. Formidable as this may seem, it only means a shift in the length ratio of M and s from 1.5 to 2.2; often it is also difficult to measure the exact length of hairs very accurately, because they do not lie parallel to the optical plane. The same holds even more strongly for the measurement of the anal spines.

The circumstances compelled me to recognize a rather iconoclastic set of new synonymies.

Onychiurus sublatius Gisin, 1957, was described after an unstated number of specimens from Austria and England. The species was considered to differ from *Onychiurus prolatus* (1) because of its smaller size, viz., 1.4-1.85 mm as against 2.3-2.6 mm in *prolatus*, (2) because the anal spines and claw are plumper in *sublatius*, and (3) because M/s = 24/7-8 (in *prolatus* originally given as 21/9, but in Gisin (1960) "as in *latus*", which would mean 29/10).

Onychiurus gisini Haybach, 1960, described from Austria, was contrasted with *O. cancellatus* Gisin, 1956, because the prespinal setae of abd_6 were said to delineate two strongly convergent lines. Apart from this character, the doubtful value of which is discussed above, there is no essential difference from *O. prolatus*.

Onychiurus prolatus conlatus was described by Gisin (1962) after material from caves in eastern Switzerland (*prolatus prolatus* was described originally from caves in the Savoy Alps and the Swiss Jura). Differentiating characters are (1) M/s ratio 19/14 (instead of 21/9), (2) a difference in shape of abd_6 (as seen in profile) and (3) the four prespinal microchaetae of abd_6 forming two slightly converging lines. (Gisin adds here that he had also observed this in a typical population of *prolatus*!)

Onychiurus prolatus trilatus was described by Gisin (1963b) from caves in France (Drôme). The subspecies was characterized by having two instead of one median hair on the tergum of abd_6 ; however, at least three adult specimens from Crete show this same character.

***Onychiurus pseudoghidinii* Dallai, 1969 (Fig. 5a)**

Material: sample 4: 1 adult and 2 subadult ♂.

Discussion. The adult specimen clearly demonstrates the (only) character that distinguishes *pseudoghidinii* from *ghidinii* Denis, 1938, viz., the third pair of pseudocelli at the ventral face of the head (Fig. 5a). However, in one of the subadult specimens these pseudocelli are greatly reduced, and in the other they are absent. In my opinion, this casts some doubt on the validity of Dallai's species, but in view of the paucity of my material I must limit myself to drawing attention to the imminent synonymy.

O. pseudoghidinii is described from the Isle of Montecristo (about 50 km S of Elba); *ghidinii*, described from the north of Italy, is also known from France,

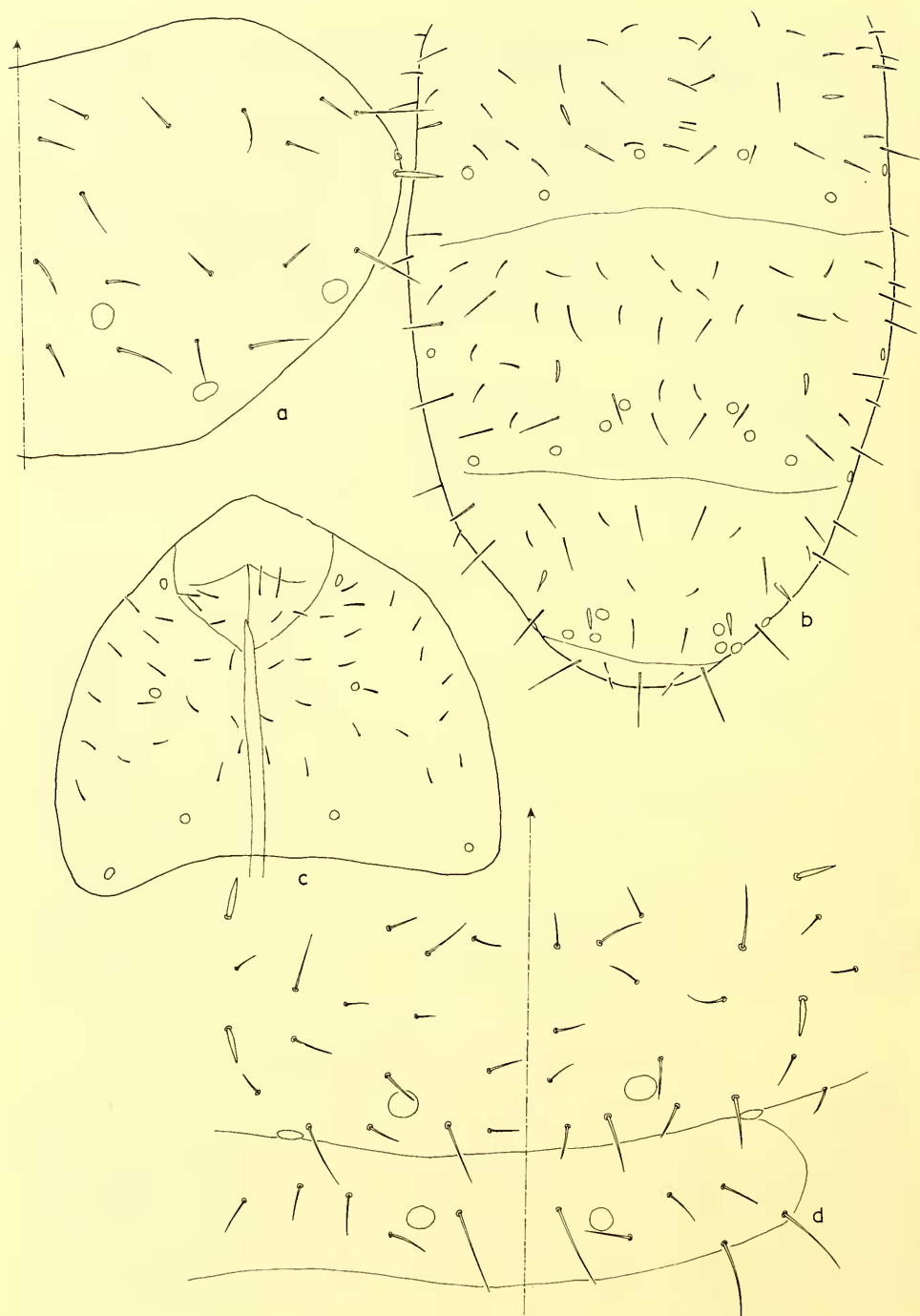


Fig. 4. *Onychiurus xenonis* n. sp. a, th₂; b, abd₃₋₆; c, ventral aspect of head; d, posterior margin of head and th₁.

Switzerland, Bulgaria, Morocco, Madeira, and the Azores. Material from the last locality has been described in detail by Hüther (1970). The material now under consideration coincides completely with Hüther's description, except that the granulation of the Greek material seems to be somewhat less developed.

In one specimen antennal organ III was guarded in both antennae by only four papillae. The other two specimens had the normal number (five).

***Onychiurus* cf. *stachianus* Bagnall, 1939**

Material: sample 6: 1 ♀; 24: 1 juv.

Description. The single adult specimen measures 1.2 mm. It agrees with the description of *stachi* Denis, 1938 (nec Bagnall, 1935, rebaptized *stachianus* by Bagnall (1939)), except that the ungues have no lateral teeth. In the absence of adult males the identification can, of course, only be tentative.

The species was described from the Postumia cave in Yugoslavia; it has been recorded from the ČSSR by Rusek (1959), from England by Goto (1953), and from Spain by Selga (1962a). Confusion with *O. pseudostachianus* Gisin, 1956 (= *stachianus* sensu Gisin, 1952) in these records cannot be ruled out, however.

***Onychiurus xenonis* n. sp. (Fig. 4)**

Material: sample 29: holotype ♀ and 6 ♀, 3 ♂, paratypes.

Description. Length only 0.6 mm. White, integument finely and regularly granulated. Antennal bases not differentiated. Differentiation into micro- and macrochaetae weakly developed; some setae swollen to the shape of sensillae. No anal spines.

Antenna₄ with small retractile papilla and sensilla in a groove above ant. org. III. The latter consists of 5 setae, 5 slender papillae, 2 straight rods, and 2 curved smooth sense clubs. Postantennal organ compound, with about 12 primary tubercles. Claw without inner or lateral teeth, unguiculus gradually tapering to a slender apex, reaching tip of unguis. No trace of furca.

On head and on all body segments except th₁ and abd₆, one or two pairs of hairs are swollen and have acquired the shape of sensillae or small spinules. On the head two such pairs are present, not far from the hind margin (Fig. 4d). Also th₂₋₃ each have a pair of such setae, which are situated laterally, just dorso-caudad to the lateral sensilla, which is apparently characteristic for all Onychiuridae and Hypogastruridae (Fig. 4a). Abd₁₋₄ each have two pairs, one of which is situated in about the middle of the width of the segment anterior to the second pseudocellus from the median, whereas the second pair of sensillae lies antero-laterally from the third pseudocellus (Fig. 4b). Abd₄ has only one pair, situated in front of the third pair of pseudocelli, and abd₅ again has two pairs, one near the anteromedian (first) pair of pseudocelli, the second anterior to the fourth pair of pseudocelli. On the sternite of abd₄, two indistinct pairs of these sensillae are present in front of the pseudocelli. Ventral tube with 6 + 6 setae.

Pseudocelli: Dorsal arrangement of pseudocelli 32/133/33354, ventral arrangement 4/000/2222. The 4th pseudocellus under the head is situated near the lateral

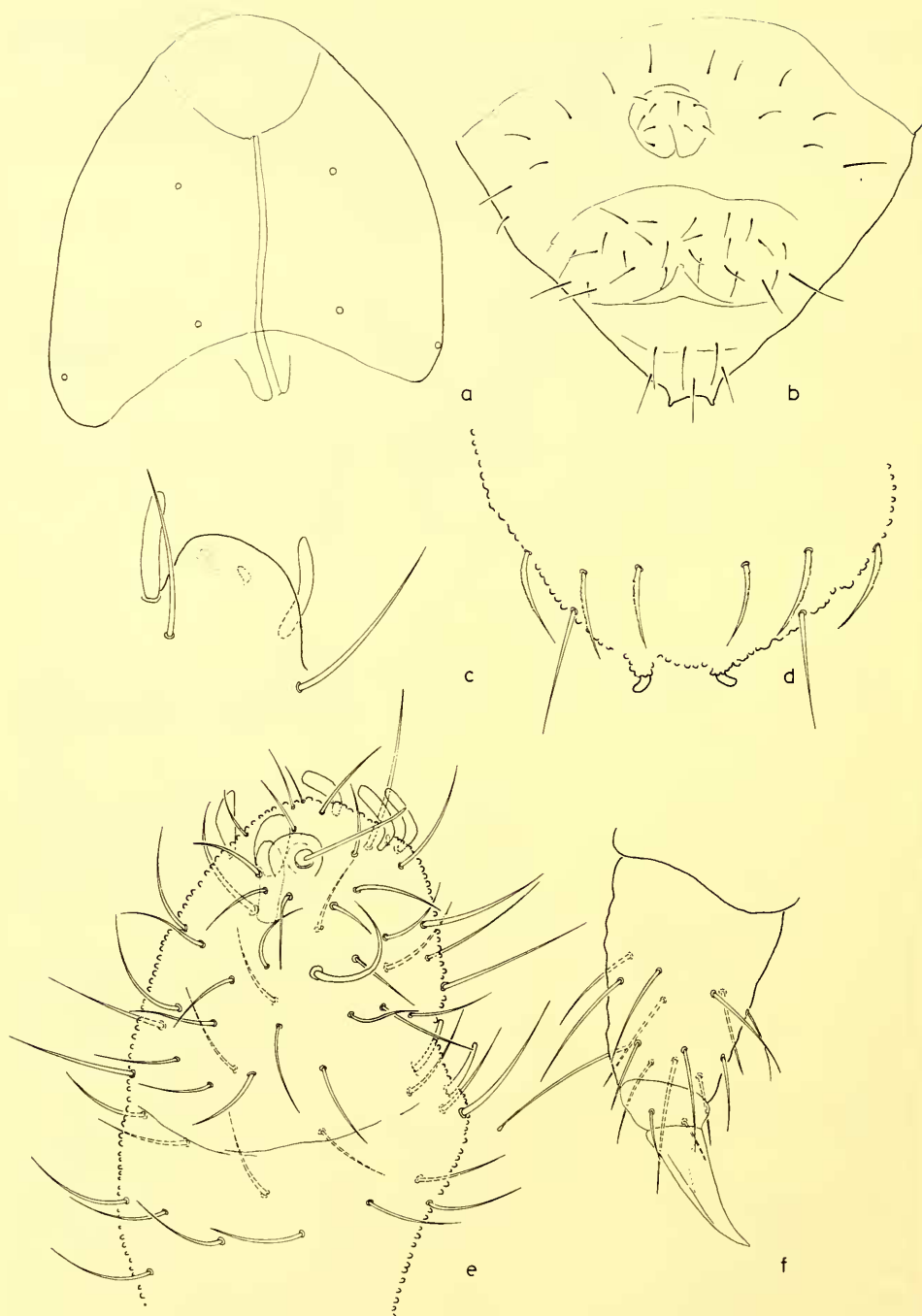


Fig. 5. *Onychiurus pseudoghidinii* Dallai, a, pseudocelli on ventral face of head. *Acheroxenylla cretensis* n. sp. b, ventral chaetotaxy of abd₃₋₆; c, antennal organ III; d, abd₆ dorsally; e, ant₃₋₄; f, claw of P₃

border of the labium. The pseudocellus is slightly oval and easily overlooked (Fig. 4c).

In the male specimens no male organ is discernible.

Discussion. The new species belongs to the *Onychiurus* (s. str.) complex of species, having normal unguiculi, smooth sense clubs in the antennal organ, and at the same time lacking anal spines. The species is conspicuous in having no less than 4 pseudocelli on the ventral face of the head, and also in possessing a number of spine-like "sensillae". This last character suggests a relationship to *O. edinensis* Bagnall, 1935, according to Murphy (1960) the valid name for *O. spinularius* Gisin, 1952. This species, however, possesses strong anal spines.

The fourth ocellus at the ventral face of the head is situated close to the lateral edge of the labium, and is easily overlooked. Nevertheless, *xenonis* is not easily confused with the species with which it seems otherwise to be most related with respect to the arrangement of the pseudocelli, e.g. *O. dunarius* Gisin, 1956.

HYPOGASTRURIDAE

Acheroxenylla n. gen.

Diagnosis. Homochaetotic Hypogastruridae. Antennae with retractile papilla, 3 outer and 1 inner cylindrical sense hairs. Postantennal organ, unguiculus, furca, and retinaculum absent. Ocelli 2+2. Tibiotarsi with 2 tenent hairs. Anal spines present.

Type species: *Acheroxenylla cretensis* n. sp.

This is another small genus of xenylline stock. Clearly, it is a close relative of *Xenylla*, as is evident from the absence of a postantennal organ, number and location of sense hairs on ant₄ and of tenent hairs on tibiotarsus, absence of the unguiculus, and the general appearance of the chaetotaxy.

However, in *Xenylla* total absence of a furca is rare; Salmon (1944) created the genus *Propexenylla* for one species having this character. But there is a complete gradation between fully developed furca (for *Xenylla*, anyway), through *X. boernerii* Axelson, to *X. acauda* Gisin and *Propexenylla atrata* Salmon. Consequently, I agree with Da Gama (1969) and place *atrata* in *Xenylla*.

The reason why I nevertheless separate *A. cretensis* from *Xenylla* lies in the number of ocelli. In almost all species of *Xenylla* (roughly 60) the number of ocelli is 5+5; in a few instances it is 4+4. I feel that inclusion of *cretensis* would unduly enlarge the scope of *Xenylla* in this respect.

Within the genera derived from *Xenylla* having fewer than 5+5 eyes, *Acheroxenylla* comes closest to *Acherontiellina* Salmon, 1964. This genus was recently redefined by Djanaschvili (1971a, b) as having cylindrical sensillae on ant₄, possessing anal spines, and completely lacking the furca. Yet *cretensis* is placed in a genus of its own, to avoid disturbing the homogeneity of *Acherontiellina* and its near relative *Acherontiella* Absolon, 1913, both of which comprise only eyeless forms.

Key to the genera of the *Xenylla* group:

1. ocelli 8 + 8 *Biscoia* Salmon, 1962
- ocelli 5 + 5 *Xenylla* Tullberg, 1869
- ocelli 2 + 2 *Acheroxenylla* n. gen. 2
- ocelli 0 + 0 2
2. furca completely absent 3
- furca more or less reduced, but present 5
3. anus nearly ventral *Xenyllina* Delamare Deboutteville, 1948
- anus terminal 4
4. sensillae on ant₄ about spherical, anal spines absent *Acherontiella* Absolon, 1913
- sensillae on ant₄ about cylindrical, anal spines present *Acherontiellina* Salmon, 1964
5. mucro not separated from dens, or absent; sensillae on ant₄ cylindrical *Acherontides* Bonet, 1945
- mucro separated from dens; sensillae on ant₄ conical, sometimes oval *Pseudacherontides* Djanaschvili, 1971

This key is essentially based on the work of Djanaschvili (1971a, b). I must add that I am not certain as to the inclusion of *Biscoia* in this group. The high eye-number, the presence of an unguiculus, the well-developed dens, and the peculiar antennal organ III, argue against its inclusion. I have nevertheless included the genus in this key, because it is reported to lack the postantennal organ.

***Acheroxenylla cretensis* n. sp. (Fig. 5 b-f, 6-8)**

Material: sample 1: 21 ♀, 32 ♂ and 2 juv.; 11: 18 ♀, 13 ♂ and 5 juv.; 17: 7 ♀; 26: 6 ♀, 1 ♂ and 1 juv.; 27: 1 ♂ and 3 juv. Moreover preserved in alcohol, not studied in closer detail, from sample 1: 196 specimens, 11: 210 specimens (mixed with some *Acherontiellina* that cannot be distinguished habitually), and from sample 17: 27 specimens. The holotype is a ♂ from sample 1.

Description. Length 0.7 mm. White; pigment absent, except for a few pigment granules clustered around the separate ocelli and occurring only in a few specimens. Integument coarsely granulate, especially on dorsal parts of thorax and abdomen. Hair cover not differentiated in micro- and macrochaetae, only setae distinctly longer than the others. Anal spines short and curved, on hardly differentiated papillae. Hairs smooth and simple, except the row of 3 + 3 setae on abd₆, which are conspicuously serrate on their anterior surface (Fig. 5d).

Antennae about 5/6 times head diagonal. Ant₄ with large retractile papilla, and 3 outer as well as 1 inner nearly cylindrical, swollen sensory hairs. Between the group of 3 there is at least one other, very small, sensilla, difficult to observe. Of the cover of apparently normal setae on ant₄, one subapical seta is inserted on some sort of wart flanking the pit of the retractile papilla (Fig. 5e). Antennal organ III consists of two long and slender sensillae, each guarded by a seta. Between the

long sensillae there is an integumentary flap that protects two small sensillae (Fig. 5c).

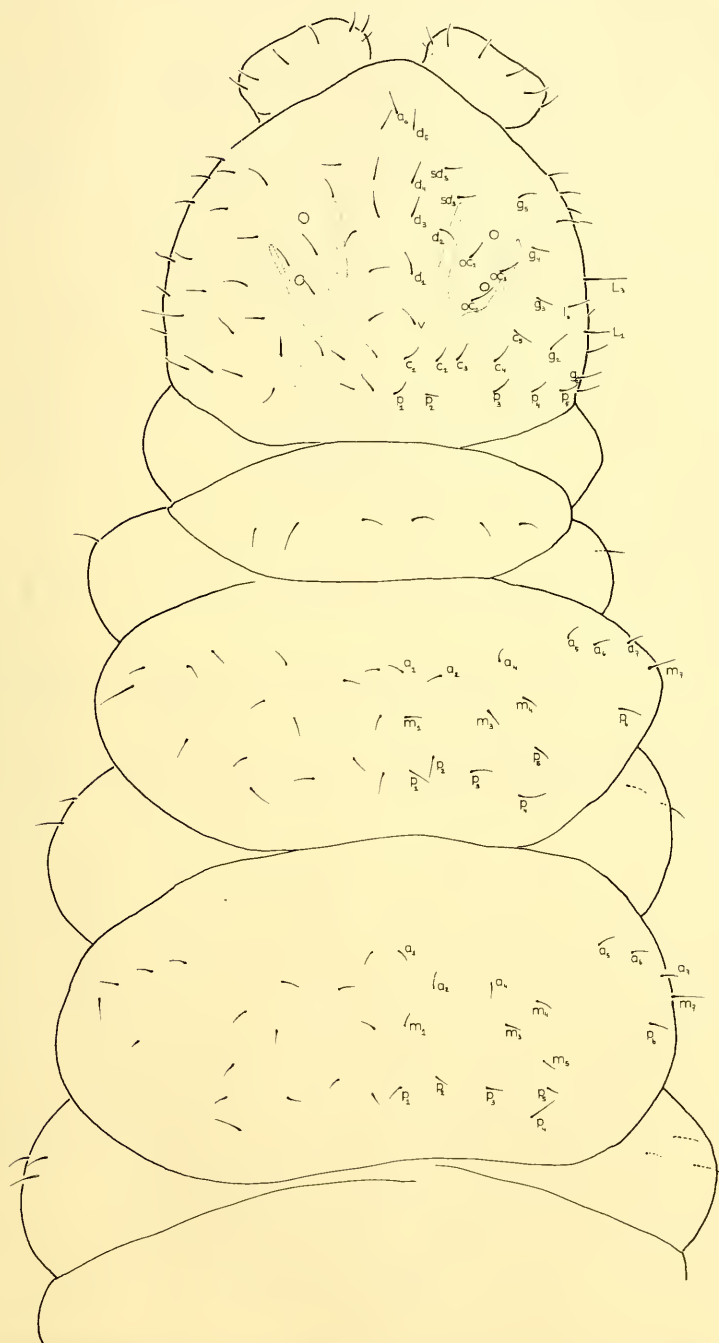


Fig. 6. *Acheroxenylla cretensis* n. sp. dorsal chaetotaxy of head and thorax

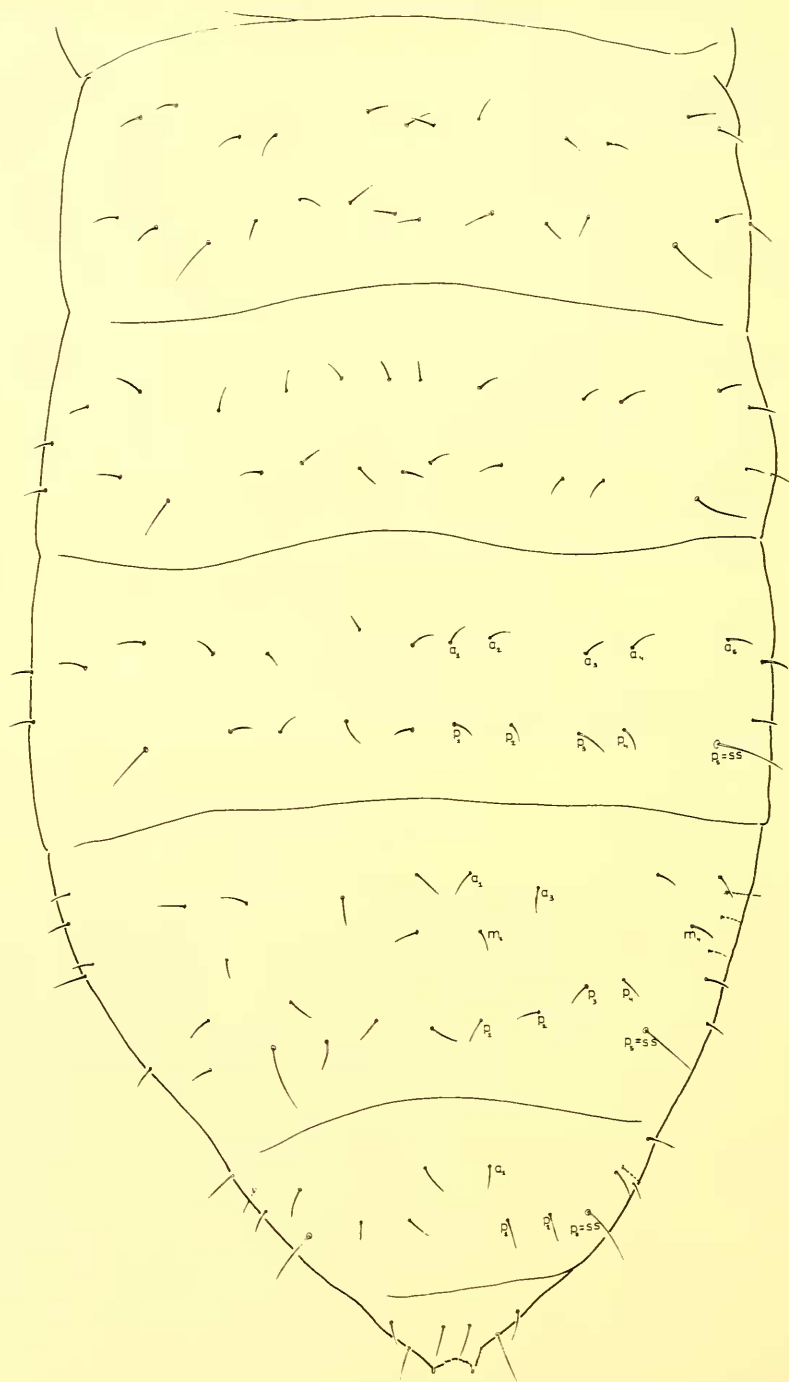


Fig. 7. *Acheroxenylla cretensis* n. sp. dorsal chaetotaxy of abdomen

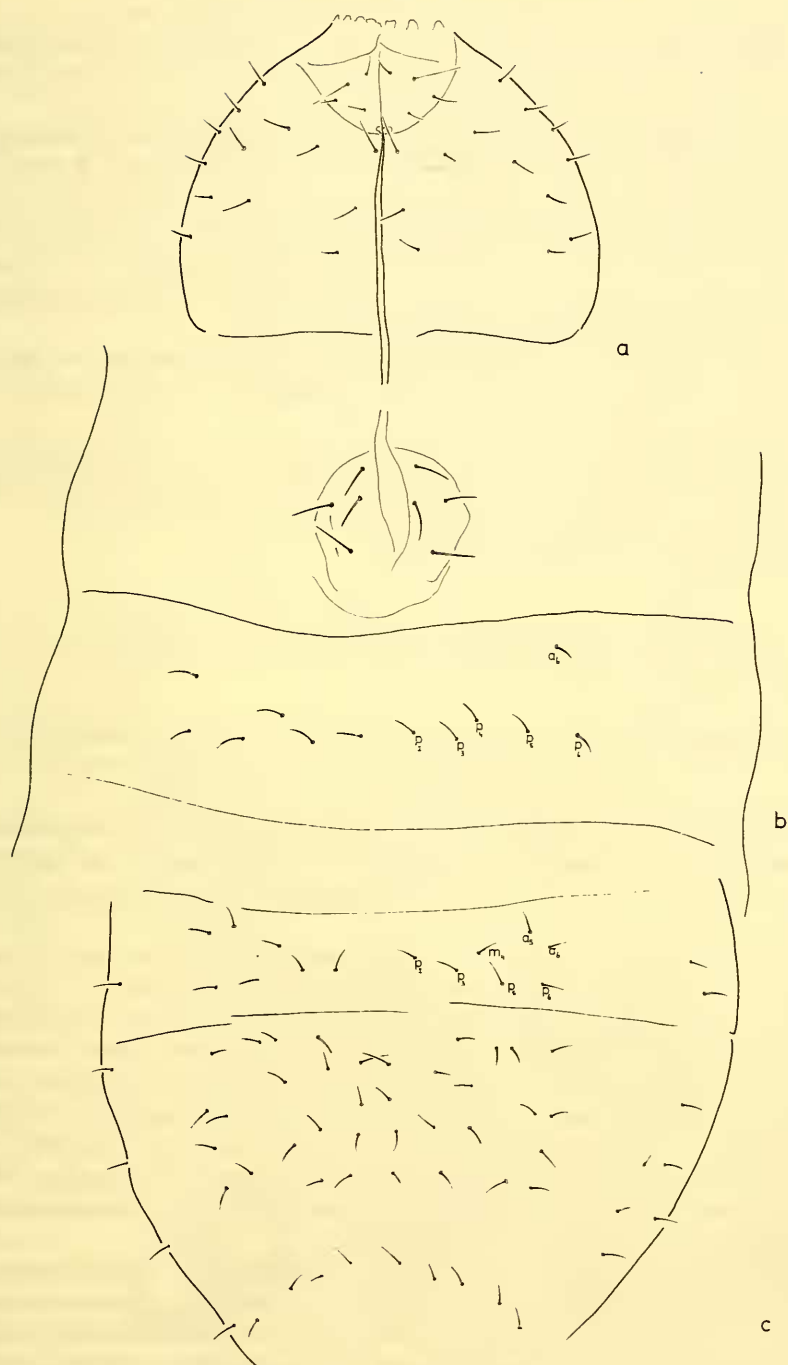


Fig. 8. *Acheroxenylla cretensis* n. sp. a, ventral chaetotaxy of head; b, ventral chaetotaxy of abd₁₋₂; c, ventral chaetotaxy of abd₃₋₄

Postantennal organ lacking. Only 2 + 2 small, widely separated ocelli.

Feet normal, short, unguiculus absent, unguis without any tooth, two dorsal tenent hairs (with one normal, short hair between them) very faintly clavate (Fig. 5f). Ventral tube with 4 + 4 setae (Fig. 8b).

Chaetotaxy. Cephalic chaetotaxy is interpreted along the lines indicated by Cassagnau (1974), who in essence restored the system of Yosii (1960). Rows p and c are complete, there is but one seta v, setae d_{1-5} and a_0 are present, the sd row is very short, consisting of but two setae, allegedly sd_3 and sd_5 . The affinity with *Xenylla* is evident, only the sd row is still more reduced. Th_1 with 3 + 3 setae. Th_{2-3} with a_1 , a_2 , a_{4-7} , m_1 , m_3 , m_4 , and m_7 , and the p row complete: p_{1-6} . Seta p_4 is ss. On th_3 , moreover, a pair of setae m_5 is present (Fig. 6).

Abd₁₋₄: seta p_5 is ss. Abd₄: in frontal row only a_1 and a_3 , in median row only m_1 , posterior row complete p_{1-5} . Abd₅: only a_1 , p_{1-3} present; p_3 = ss. Abd₆ with 3 + 3, anteriorly serrate setae (Fig. 7).

Ventral chaetotaxy: Head with a_1 , m_1 , and p_1 present, m_{2-3} lacking (Fig. 8a). All thoracic sternites and abd₁ without setae. Abd₂: a_6 , p_1 , p_{3-6} (Fig. 8b). Abd₃: a_{5-6} , m_4 , p_1 , p_3 , p_{5-6} . It is not possible to analyse the setae on abd₄ (Fig. 8c).

Subcoxae 1-3 with 1, 2, 3 setae, respectively.

***Acherontiellina bougisi rhodia* (Ellis, 1974) n. comb. (Fig. 9 a, b)**

Acherontiella bougisi rhodia Ellis, 1974.

Material: sample 4: 8 ♀, 9 ♂, and 1 juv.; 6: 8 ♀ and 1 ♂; 7: 5 ♀ and 1 ♂; 9: 2 ♂ and 1 juv.; 10: 2 ♀; 11: 4 ♀, 1 ♂, and 1 juv.; 16: 2 ♀; 29: 4 ♀ and 1 ♂; 30: 13 ♀ and 6 ♂; 32: 2 ♀, 1 ♂, and 1 juv.; 33: 1 ♂ and 1 juv.; 34: 3 ♀ and 3 ♂.

Discussion. The present material is in good agreement with the two specimens from Rhodes on which I based the subspecies. The larger material now available permits me to add some supplementary details and to analyse some aspects of the variability.

The internal tooth at the unguis is usually clearly visible. Generally, though perhaps not in all specimens, the two tenent hairs are feebly clavate.

As I have already indicated, the dorsal chaetotaxy is identical to that of *bougisi bougisi*, discussed and illustrated by Thibaud (1967). However, some variability interferes with this agreement. In particular, seta a_0 on the head is rather often lacking (in 27% of 60 observations). The row of setae sd, basically consisting of three setae sd_{3-5} , is reduced in some cases to two hairs sd_{4-5} . In 3% of the observations this reduction of sd occurred on only one side, in another 4% it occurred symmetrically ($n = 61$). In one specimen seta v was lacking on both sides, and in 5% (3 cases) only unilaterally ($n = 61$).

The ventral chaetotaxy can be summarized as follows. The head possesses a_1 , m_1 , and m_3 as well as generally a pair of setae p_1 . In 16% seta p_1 is lacking on one side, in 5% on both ($n = 71$) (Fig. 9b). The thoracic sternites are without setae. The ventral tube has 4 + 4 setae as in *Xenylla*. Ventral chaetotaxy of abd₂₋₃ is very irregular, in abd₂ a_6 is distinct, and there is a very unstable row p, consisting of 5 + 5 setae; either p_2 or p_3 is particularly strong and seems to have a sensory

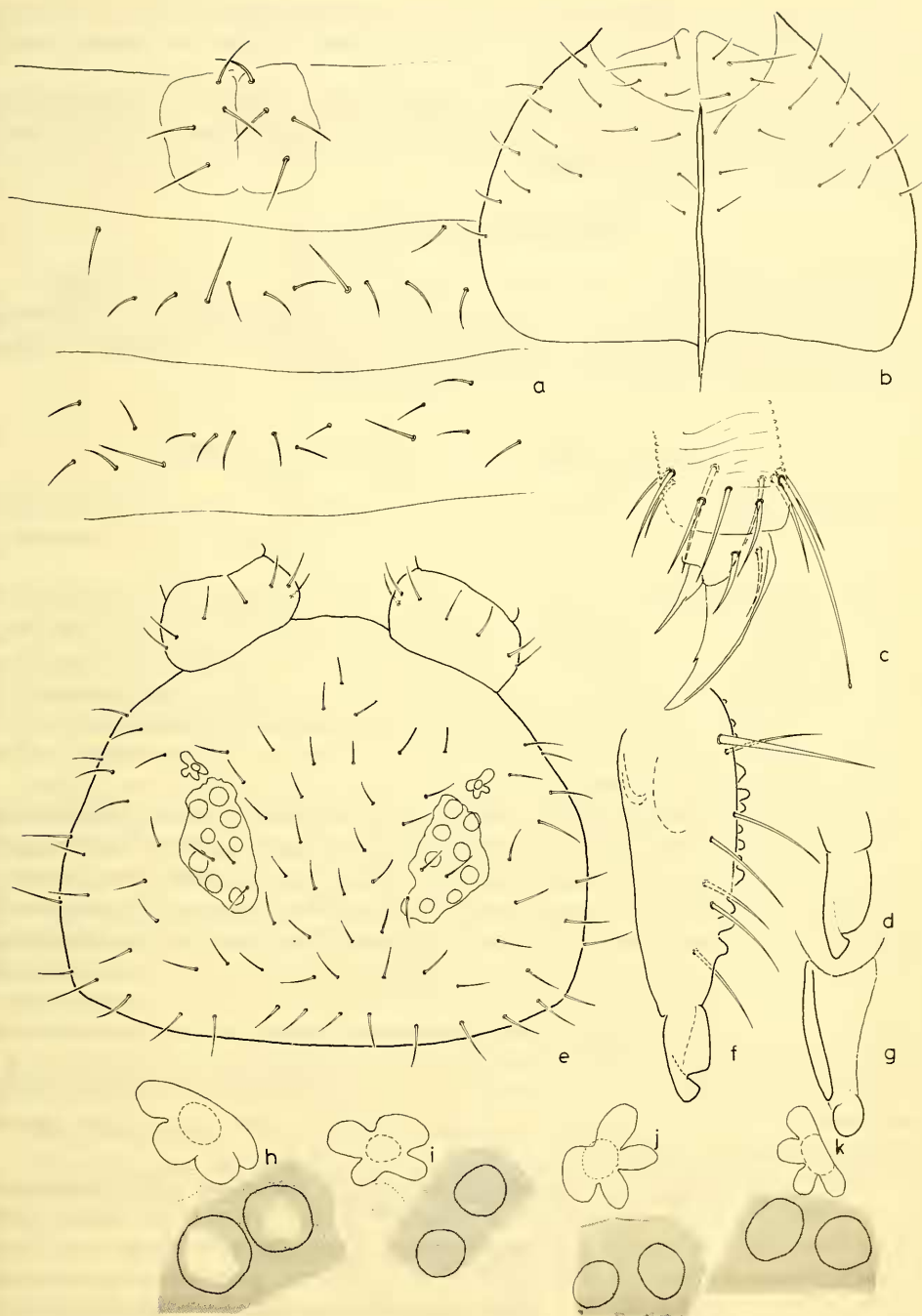


Fig. 9. *Acherontiellina bougisi rhodia* (Ellis). a, ventral chaetotaxy of abd₁₋₃; b, ventral chaetotaxy of head. *Hypogastrura* cf. *gisini* Strenzke. c, unguis P₃; d, mucro exterior; e, dorsal cephalic chaetotaxy; f, lateral aspect of mucrodens; g, posterior face of mucro; h, i, j, k, postantennal organs

function (Fig. 9a). In abd₃ setae a₃₋₆ are evident, but it was not possible to discern a row m or p, nor was the position of a pair of sensory hairs sufficiently stable to establish a fixed scheme.

By transferring *bougisi* to the genus *Acherontiellina*, I adopt the classification proposed by Djanaschvili (1971a, b), which is assimilated into the key to the genera of the *Xenylla* group (p. 238).

Xenylla maritima Tullberg, 1869

Material: sample 3: 3 ♀, 1 ♂, and 4 juv.; 50: 17 ♀ and 4 ♂ + 8 ex. in alcohol.

Xenylla maritima is a well-known species, reported from all European countries and, with varying certainty, elsewhere. The material agrees completely with the detailed chaetotactical description by Da Gama (1969).

Ceratophysella succinea (Gisin, 1949) (bona species?)

Material: sample 23: 2 juv.; 24: 1 ♂; 26: 3 ♀ and 9 juv.; 32: 1 ♀ and 1 juv.; 37: 1 ♀; 41: 2 ♂ and 7 juv.; 44: 2 juv.; 48: 2 ♀, 4 ♂, and 8 juv. + 15 ex. in alcohol; 49: 4 ♀, 1 ♂, and 1 juv.

Discussion. The material is easily placed in species group A₁, the *denticulata* group, of Bourgeois & Cassagnau (1972): on abd₄ are present: a₁ and a₃, m₁ and m₄, and p₁₋₃, where p₂ and p₄ are macrochaetae and p₃ is ss. Within this group, the material could be attributed to *C. engadinensis* (Gisin, 1949), characterized by having 7+7 setae on the dentes and normal anal spines; or alternatively to *C. succinea*, which was differentiated on the basis of its having only 6+6 setae on the dentes and strong, yellow anal spines.

Since Cassagnau and his collaborators' work on ecomorphosis and epitocal processes in Hypogastruridae has shown that characters derived from integumentary details other than chaetotaxy are unstable and of limited use, the last-mentioned characters must be approached with caution. However, the number of dental setae was not more informative in the present material. In fact, all gradations between 5+5 and 7+7 setae were encountered: 5+5: 1 ×; 5+?: 1 ×; 5+6: 2 ×; 5+7: 1 ×; 6+6: 12 ×; 6+?: 2 ×; 7+6: 10 ×; 7+7: 12 ×; 7+?: 4 ×. It was not possible to correlate the number of dental setae with the size of the specimens or their sexual maturity. For 41 observations, I obtained a correlation coefficient of $r = 0.255$; for a 5% significance, a value of 0.321 would be required. In sample 26, no specimen with more than 6 setae per dens were found, but in the other, larger samples all values occurred.

Evidently, some doubt concerning the separation of *succinea* and *engadinensis* is warranted. However, in this genus, perhaps more than in any other collembolan group, the results of rearing experiments must be decisive and, basing myself on material from a different faunal region, I do not dare to synonymize two species described after Swiss material. I prefer to identify my Greek material with *succinea*, because the specimens generally have honey-coloured anal spines, which are indeed rather long, and moreover because *succinea* has already been mentioned from Greece (Evvia) by Bourgeois & Cassagnau (1972).

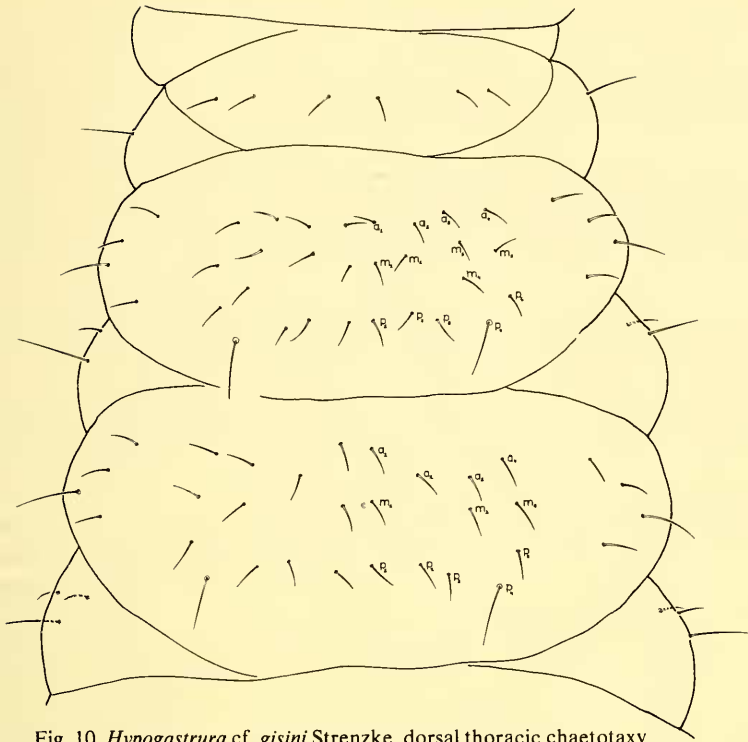


Fig. 10. *Hypogastrura* cf. *gisini* Strenzke. dorsal thoracic chaetotaxy

Seta a'_2 on abd₅ (i.e., the seta differentiating *C. denticulata* from *engadinensis*), which Bourgeois & Cassagnau found in 33% of their adult specimens of *succinea* from Evvia, only occurred sporadically in my material; it was found in two immatures from sample 26, and in a female from 49, each time on one side only.

C. succinea has been recorded from Spitsbergen, Jan Mayen, Germany, Switzerland, Austria, the USSR, Bulgaria, and Yugoslavia. There are records of *engadinensis* from Switzerland, Austria, Poland, France, and Spain.

***Ceratophysella gibbosa* (Bagnall, 1940)**

Hypogastrura occidentalis Gisin, 1958.

Material: sample 32: 1 ♀; 34: 1 juv.; 41: 8 juv.; 42: 1 juv.

This species, described from the British Isles, is, according to Yosii (1966a) "almost cosmopolitan". *H. occidentalis* was described from Madeira.

***Ceratophysella armata* (Nicolet, 1841)**

Material: sample 35: 4 juv.; 36: 1 juv.; 43: 5 juv.

The species has been recorded from most European countries. It is difficult to assess the distribution of the species, because the classical species *armata* has been subdivided during recent decades.

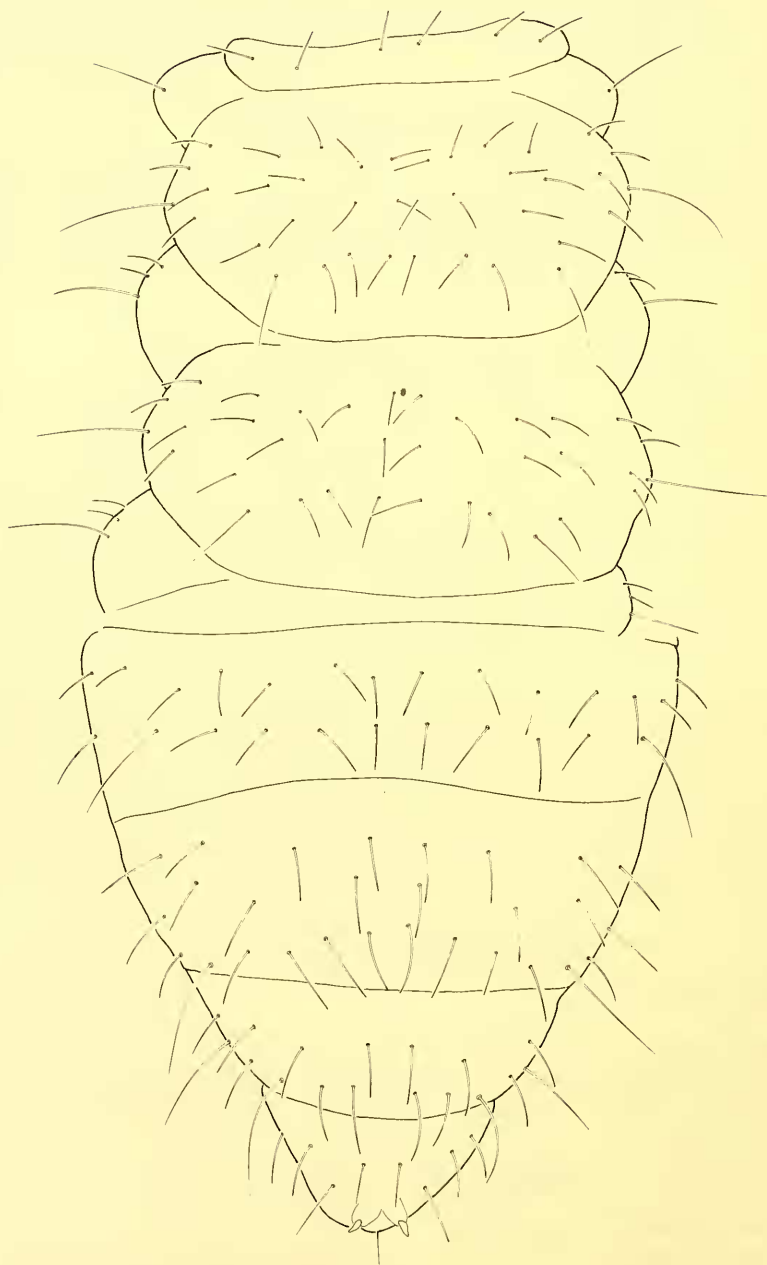


Fig. 11. *Hypogastrura tethyca* n. sp. dorsal chaetotaxy of thorax and abd₃₋₆

Hypogastrura cf. *gisini* Strenzke, 1955 (Fig. 9 c-k, 10, 12 a-e)

Material: sample 3: 1 ♀; 10: 10 ♀, 2 ♂, and 1 juv.; 11: 1 ♂; 13: 1 ♂ and 1 juv.; 18: 2 ♀ and 4 ♂; 23: 12 ♀, 4 ♂, and 3 juv.; 26: 2 ♀; 27: 1 ♂; 32: 4 ♀ and 1 ♂; 33: 8 ♀, 5 ♂, and 1 juv.; 36: 5 ♀.

Description. Total length 0.9-1.1 mm. Sparse greyish-blue pigment, scattered lightly, even eye patches not completely obscured. Integument moderately and rather evenly granulate. Posterior face of dens not much more strongly granulated. Anal spines short (about 6-7 μ , or $\frac{1}{2}$ - $\frac{1}{3}$ unguis P_3), curved, on papillae which are as high and only free at the base (Fig. 12a). Eyes 8+8.

Antennae about as long as diameter of head, with retractile apical papilla, 1 inner and 3 outer slightly swollen and curved sense hairs. Antennal organ III normal. Postantennal organ small, about two times as large as next ocellus, with 4 (occasionally 3) short and wide lobes, about as large as central part, broadly attached. Accessory tubercle often invisible (Fig. 9h-k).

Tibiotarsi with 1, 1, 1, weakly clavate tenent hairs. Unguis with small inner tooth; no lateral teeth visible; unguiculus about half as long as unguis, with a very weak basal lamella, tapering apically (Fig. 9 c). Ventral tube with 4+4 setae; retinaculum with 3+3 teeth.

Dens with 7+7 setae, posterior face not strongly granulated, about 2.5-3 times mucro (Fig. 9f). Mucro of *assimilis*-type, with globular apical tooth and a rather high outer lamella (Fig. 9d, g).

Chaetotaxy. All hairs comparatively long, smooth. No differentiation into micro- and macrochaetae. Chaetotaxy of head complete (row p, c, d_{1-5} , sd_{1-5} , a_0 , oc_{1-3} , v_{1-2}). Thoracic chaetotaxy: th_1 : 3+3 setae; th_2 : a_{1-4} , m_{1-5} , p_{1-5} , $p_4=ss$. Th_3 is as th_2 , except that m_2 and m_4 are missing (Fig. 10). Subcoxae 1, 2, 3.

Abdomen $_{1-3}$ with two rows. Abd $_4$ with complete a and p rows, and ss in p_3 . The m row is represented by m_1 , m_3 , and m_5 . However, irregularities occur rather frequently, especially in m_3 , but even the p row may be affected, Abd $_5$ with a_{1-3} and p_{1-3} ($p_3=ss$), and also an m row normally composed of 3+3 setae. Here as well, irregularities occur rather frequently, and affect especially the presence of m_1 (Fig. 12b-d).

Ventral chaetotaxy of head complete (a_1 , m_1 , m_2 , p_1). Th_{1-3} without setae.

Discussion. The Greek material comes reasonably close to *gisini* Strenzke, which has been described from sandy beaches along the German North Sea and Baltic coasts. There is only one striking difference: *gisini* has an unguiculus $\frac{1}{4}$ - $\frac{1}{3}$ the length of the unguis, whereas in the Cretan material it is much longer. It is unfortunate that the chaetotaxy of *gisini* is not known; I have not been able to examine type material.

The material also shows a striking resemblance to *H. capitata* Cassagnau & Delamare Deboutteville, 1955, from the Lebanon. This species differs in possessing a strong tooth at the unguis, an unguiculus with a distinct lamella, a dens with 6 setae and a proportionally shorter mucro, and feebly clavate body setae. Since not all of these characters are very decisive, a redescription of *capitata* is necessary.

Another species, *H. christianseni* Yosii, 1960, from the United States, could

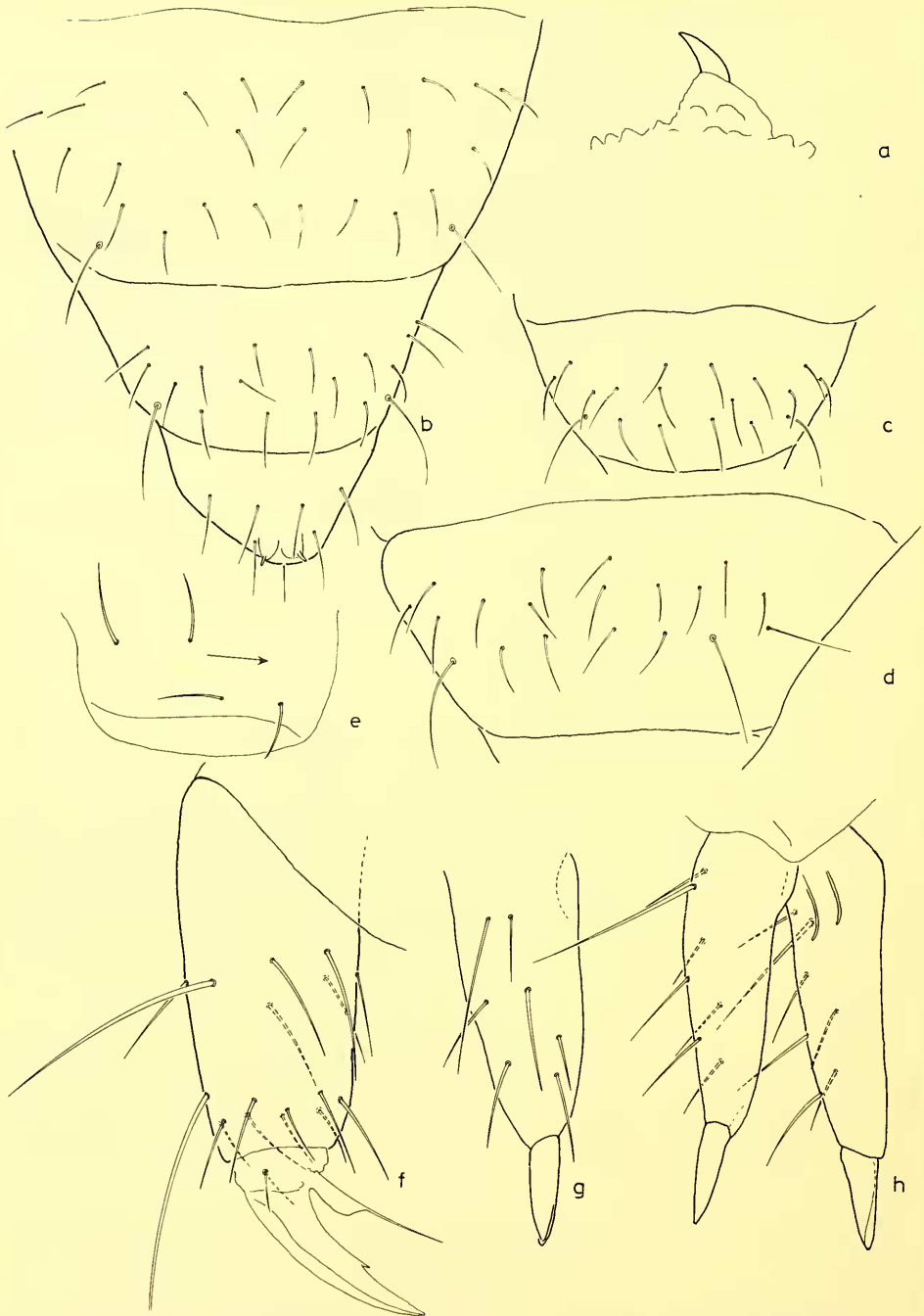


Fig. 12. *Hypogastrura* cf. *gisini* Strenze. a, anal spine in lateral view; b, dorsal chaetotaxy of abd₄₋₆; c, d, dorsal chaetotaxy of abd₅ of two different specimens. *Hypogastrura tethyca* n. sp. e, ventral tube in lateral view; f, tibiotarsus and claw of P₃; g, posterior face of dens; h, oblique view of mucrodentes of another specimen

according to its description be conspecific with the present material. Upon my request, Professor Yosii kindly gave me the type-series of this species. A study of this material revealed seta m_2 to be present on th_2 , contrary to the original description. At the time of that publication, the improbability of the absence of this hair was of course not yet known. This finding seemed to remove the last point of difference, but on the same occasion the number of retinacular teeth, stated incorrectly to be 3+3, proved in reality to be 4+4. This, as Yosii remarks, brings *christianseni* into close proximity with *assimilis* Krausbauer, 1898; it remains distinct because it bears an m row on abd_3 .

***Hypogastrura manubrialis* (Tullberg, 1869)**

Material: sample 23: 2 ♀, 3 ♂, and 3 juv.; 31: 1 ♂; 32: 6 ♀, 4 ♂, and 1 juv.; 41: 5 ♀, 2 ♂, and 1 juv.; 42: 3 ♂; 47: 1 ♀.

Discussion. *H. manubrialis* is easily distinguished from the foregoing species by the larger number of antennal sense hairs, the different structure of the PAO (the lateral tubercles are located above their insertion on the central tubercle, and thus seem mutually unconnected), the retinaculum with 4+4 (in a few instances 3+4) teeth, the slender acute mucro, the coarsely papillate posterior face of dens, and the small almost straight anal spines. Bourgeois & Cassagnau's (1972) observation that m_2 is missing in th_2 is confirmed.

The species has been recorded from most European countries, and also from most continents.

***Hypogastrura tethyca* n. sp. (Fig. 11, 12 e-h, 13)**

Material: sample 10: 1 ♀; 30: 3 ♀, 4 ♂, and 1 juv.; 31: 10 ♀ and 8 ♂; 32: 2 ♀; 37: 1 ♂ and 1 juv.; 43: 1 ♀ and 1 ♂; 44: 5 ♀, 12 ♂, and 6 juv.; 45: 1 ♂ and 1 juv. Holotype is a ♂ from sample 44.

Description. Length of largest specimens 1.9-2.0 mm. Bluish-grey pigment forms irregular mottling, and an irregular panther-pattern all over the body, but less pronounced on ventral parts and extremities. Dens in particular almost without pigment.

Integument finely and regularly granulate.

Antennae about 0.9 times head diagonal. Ant_4 with retractile, entire papilla, 3 outer and 1 inner slender, strongly curved sense hairs, ventrally about 20 short stiff apically truncate hairs form a kind of sensory rasp. Ant_3 with 2 short curved sensillae and 2 long and rather slender sense hairs (Fig. 13 e).

Eyes 8+8 on intensely pigmented eye patch. Postantennal organ distinctly wider than nearest ocellus, consisting of 4 bladders, the anterior two the longest. Accessory boss present (Fig. 13 f, g). Rim of labrum with 4 flat protuberances (Fig. 13 d); labral setae 4/5, 5, 4.

Tibiotarsi with 1, 1, 1 long, feebly but distinctly clavate tenent hairs. Unguis with distinct internal tooth, lateral teeth absent or extremely small. Unguiculus with large basal lamella and a filament about 2/3 internal length of unguis (Fig. 12 f).

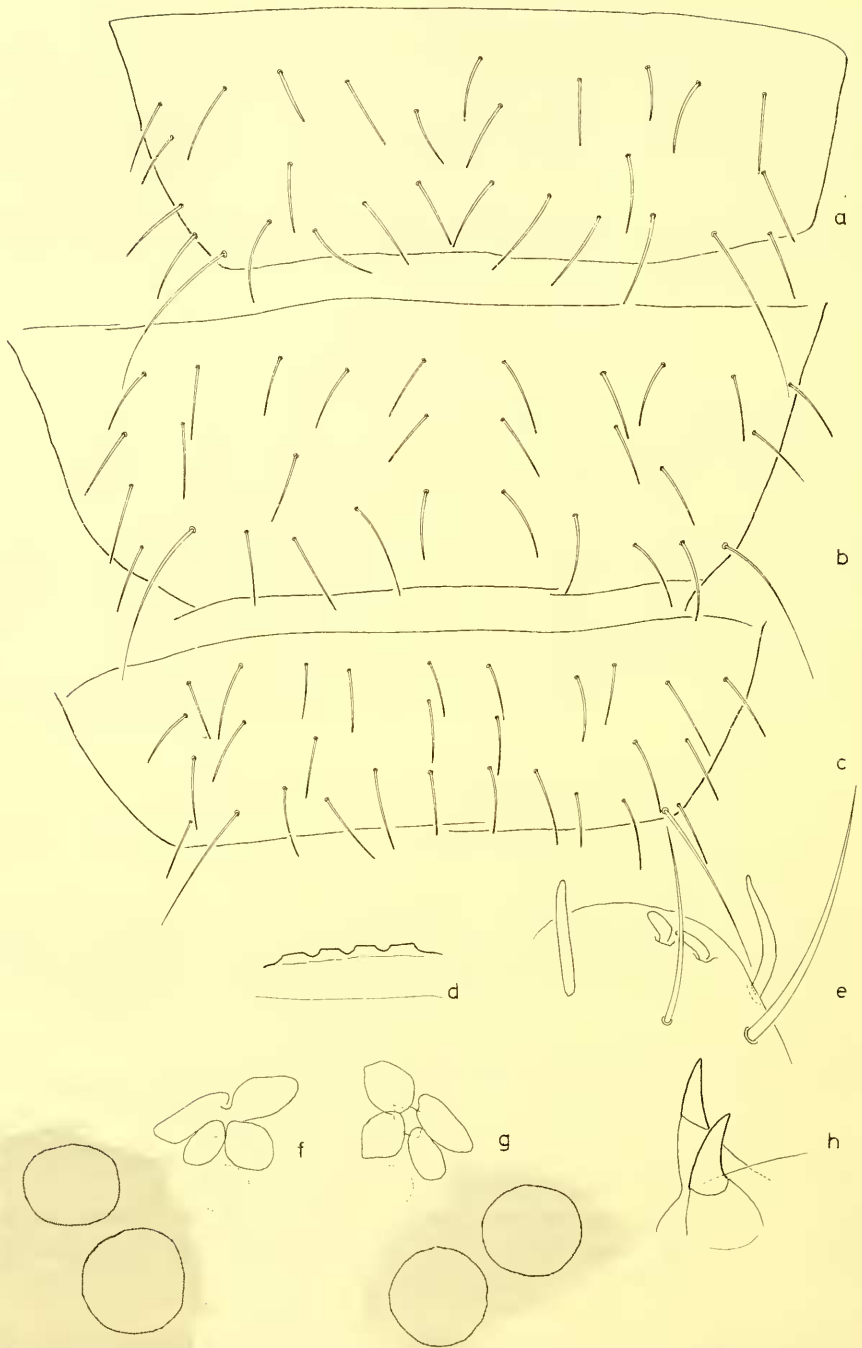


Fig. 13. *Hypogastrura tethyca* n. sp. a, b, c, dorsal chaetotaxy of abd₄ of three specimens; d, labral margin seen from ventral; e, antennal organ III; f, g, postantennal organs of two specimens; h, anal spines in oblique view

Ventral tube with 4+4 setae (Fig. 12 e). Retinaculum with 4+4 teeth, rarely 3+4.

Dens 100 μ , mucro about 36 μ . Dens with 7 setae. Posterior face of dens finely granulated. Mucro elongate, with only very weak inner and outer lamellae (Fig. 12 g, h).

Anal spines well developed, slightly curved, ca. 19 μ , on (almost touching) anal papillae of 22 μ (Fig. 13 h).

Chaetotaxy composed of strong, comparatively stiff, at their anterior face rugose to slightly serrate, setae. The setae are all alike, except that in posterior direction the dorsal setae become stronger. Setae sensuales easily recognized by their length and structure.

Cephalic chaetotaxy with complete rows p and c, $v=2$, d and sd = 5, oc = 3, a_0 present. Th_1 3+3 setae. Th_2 complete, $p_4 = ss$; th_3 as th_2 but m_2 and m_4 missing (Fig. 11). Abd_{1-3} with two rows of setae. Abd_4 difficult to interpret because of many irregularities (Fig. 13 a-c). The p row is always complete. Between setae p_5 (ss) a row normally shows only 3+3 setae, but not infrequently 3+4 or 4+4; the m row consists of 3+3 or 2+2 setae. Abd_5 with 2+2 setae in the a row between p_3 - p_3 , and never with an m row (Fig. 11).

Ventral chaetotaxy of head with a_1 , m_{1-3} , p_1 . Thorax ventrally without setae.

Diagnosis. I find it very difficult to give this species a place in the genus. Using the key given by Gisin (1960) one arrives blindly at *Hypogastrura sahlbergi* (Reuter, 1895) or *H. capitata* Cassagnau & Delamare, 1955. The new species differs from the former by the different shape of the anal spines and their papillae, by the structure of the setae — short, slender, and pointed in *sahlbergi*, long stiff bristles in *tethyca* — and above all by having not 7-8 setae at each side of the ventral tube, but the normal number 4+4. *H. capitata*, seemingly more closely related to *H. gisini*, has 3+3 teeth on the retinaculum, clavate body setae, and a different mucro.

The strong basal lamella of the unguiculus is reminiscent of such species as *tullbergi*, *viatica*, etc., but these have more than 1 clavate tenent hair on the tibiotarsi. *H. monticola* Stach, 1946, has the single tenent hair not clavate, very short anal spines, and a "spoon-like" mucro. *H. packardi* (Folsom, 1902) has capitate body setae, an extremely heavy clavate tenent hair, and, even in the forma *dentata*, too short an unguiculus; according to Bourgeois & Cassagnau, the chaetotaxy is differentiated into micro- and macrochaetae. *H. aterrima* Yosii, 1972, from Japan, has 3+3 teeth on the retinaculum and a strong differentiation into micro- and macrochaetae. *H. paradoxa* Yosii, 1965, also from Japan, seems in some respects close to *tethyca*: 1 clavate tenent hair on tibiotarsus, same shape of anal spines and claw, etc.; however, that species forms a link with *Ceratophysella* in having a small exsertile sac between ant_3 and ant_4 as well as a peculiar chaetotaxy, an m row being fully present on abd_4 and abd_5 . In *H. theeli* (Tullberg, 1876) s. Yosii, 1972 = *H. trybomi* (Schött, 1893) s. Hammer, 1953, the tenent hair is not clavate. *H. macrotuberculata* Hammer, 1953, has a highly divergent mucro with a high lamella.

The species is dedicated to Tethys, goddess of the sea, who embodies at the

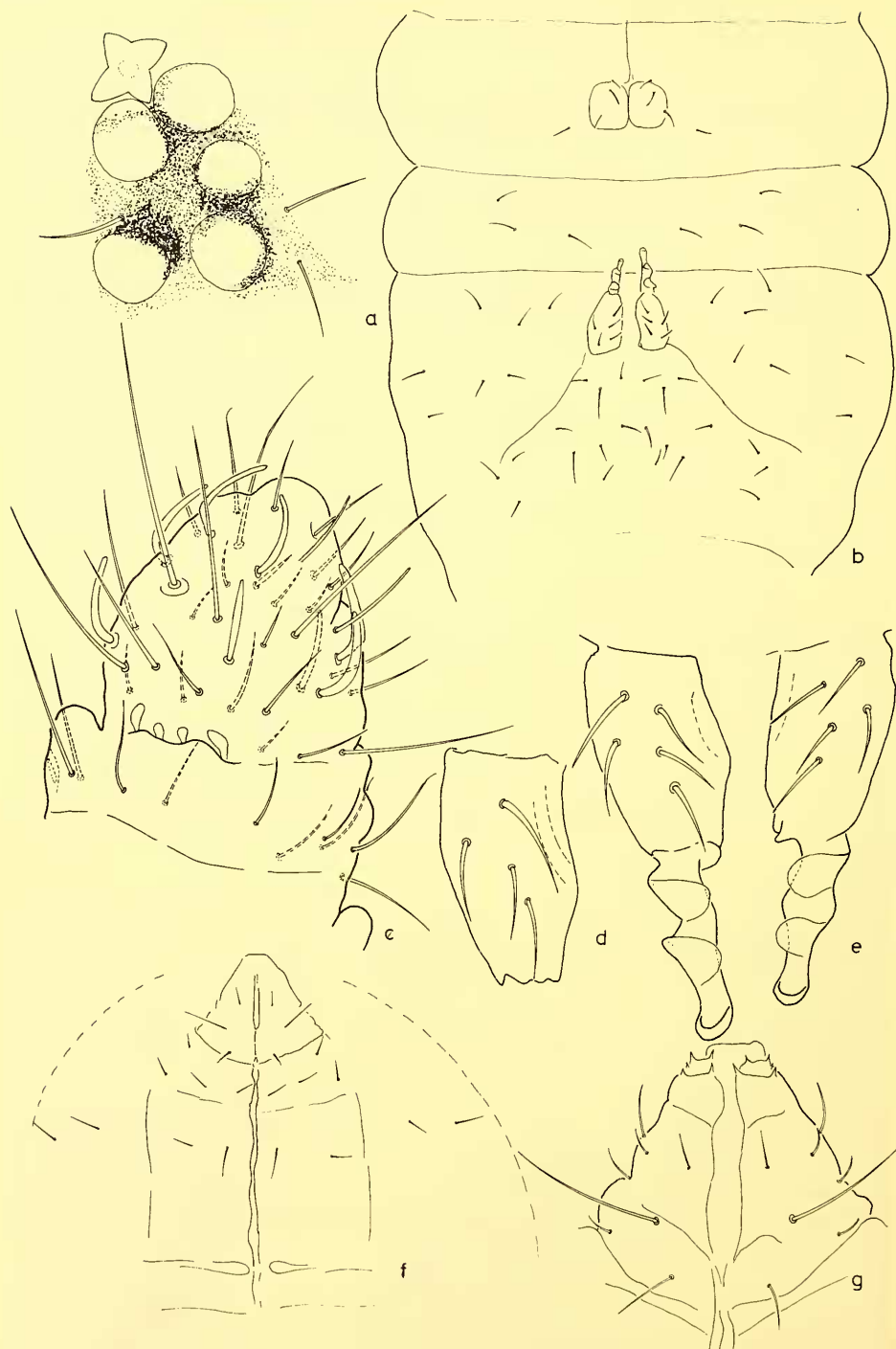


Fig. 14. *Odontella nana orientalis* n. ssp. a, eye patch and postantennal organ; b, ventral chaetotaxy of abd₁₋₄; c, ant₃₋₄; d, atypical dens; e, typical mucrodentes; f, ventral chaetotaxy of head; g, mouth cone

same time the very sea that shaped the present zoogeographical pattern of the Greek Collembola.

***Hypogastrura vernalis* (Carl, 1901)**

Material: sample 10: 4♀ and 1♂; 17: 2♀ and 1♂.

Recorded from Scandinavia to the Mediterranean and from the British Isles to Poland. Along the Mediterranean it has been found from the Iberian peninsula to Yugoslavia.

NEANURIDAE

***Odontella nana orientalis* n. ssp. (Fig. 14, 15, 16 a-b)**

Material: sample 29: 1♀ and 7♂; holotype is a ♂.

Description. Mean length of the males is 0.60 mm ($s = 0.016$, $s_x = 0.006$ mm), the single female measures 0.89 mm; statistically, this difference is strongly significant ($t = 16.353$, $df = 6$, $P < 0.001$).

Greyish-blue pigment sparse on dorsal parts of body and head and, even more so, on feet and furca. Eye patch strongly pigmented. Integument with primary granules arranged in a tetragonal lattice. The skin is strongly folded in an irregular way. Habitus normal for the genus, with very short conical antennae.

Mouth-parts normal for the genus (Fig. 14 g), labium with some short and 1 + 1 long hairs. Ocelli 5 + 5, c somewhat smaller than the others. Postantennal organ a pretty four-pointed star, perfectly symmetrical (Fig. 14 a). Ant₃ with a sensilla at outer face. Ant. organ III two short cones, and laterally from them two bent, swollen claviform clubs. Ant₄ with 8 sense hairs and an apical cupola (Fig. 14 c).

Claw slender, with strong basal tooth on inner lamella, and a pair of teeth basally on lateral lamellae. No unguiculus. No clavate tenent hair (Fig. 16 b).

Ventral tube with 3 + 3 setae. Retinaculum tridentate. Dentes with 5 + 5 setae (Fig. 14 e) but one specimen had 4 + 5 (Fig. 14 d). Mucro typical. Male genital tubercle small, with 10 setae. Female genital cleft guarded by no more than 3 setae. Ventral flaps of anal segment with some remarkably strong setae. Anal spines very short and conical, on very low papillae. The anal spines are often present on one side only, and in one instance one was cleft. The presence of the spines is evidently an unstable character, although their shape is very constant.

Chaetotaxy (Fig. 15), composed of fine, rather short, smooth setae which are never clubbed. Cephalic chaetotaxy rather reduced: present are p_{1-4} , c_3 , (p_1 may sometimes seem to be c_1 as well), d_1 , d_{3-5} , sd_{3-5} , oc_{1-3} ; a_0 is absent. Th_1 with the peculiar number of 4 + 4 setae. Th_{2-3} identical, with a_1 , a_{3-5} (other setae of a row difficult to interpret, see Fig. 15), m_1 , m_4 , p_{1-2} , $p_4 = ss$, p_5 . Cassagnau (1974) gives a somewhat different interpretation of the thorax of *O. nana* Cassagnau, 1954. According to this author, a_2 is present in th_2 , but absent in th_3 . Some individuals on a slide with specimens of *nana*, preserved in the collection of the Laboratoire d'Ecologie générale, Brunoy, unfortunately without indication of locality, showed a much more median position of the hair on th_2 labelled by me as a_3 , i.e., almost

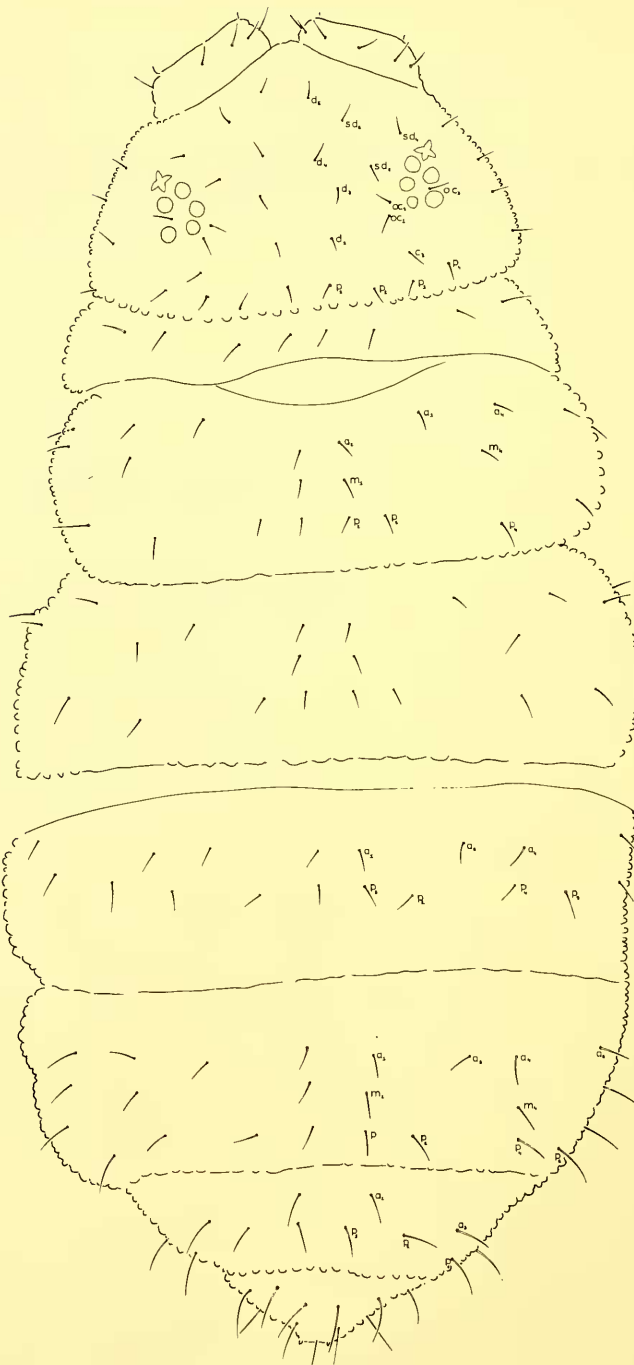


Fig. 15. *Odontella nana orientalis* n. ssp. dorsal chaetotaxy

anterior to p_2 . Otherwise, they seemed identical to the Greek specimens in chaetotaxy.

Abd₁₋₃ alike, with two rows, consisting of a_1 , a_{3-4} , p_{1-2} , p_{4-5} ; $p_5 = ss$. Abd₄ as abd₁₋₃ but with the insertion of an m row with m_1 and m_4 . Abd₅ with a_1 , a_3 , p_{1-3} ; $p_3 = ss$.

Ventral chaetotaxy of head with a_{1-3} , m_{1-2} , no posterior setae (Fig. 14 f). Thoracic sternites without setae. Abd₁ with 1 + 1 setae near the ventral tube. Abd₂ with 2 + 2 setae in the posterior, and 1 + 1 in the anterior row. Abd₄ and the manubrium with a complicated array of setae (Fig. 16 b).

Discussion. Judging by the shape of the postantennal organ, the comparatively large number of sense hairs on ant₄, and the presence of anal spines, the Cretan material belongs in the group of *O. stachi* Denis, 1947, described after one specimen from Burgundy, *O. nana* Cassagnau, 1954, described after a single specimen from the Pyrenees, and *O. vallvidrerensis* Selga, 1966, proposed for a richer material from NE Spain. It differs from *vallvidrerensis* in having 5 + 5 instead of 4 + 4 setae on the dentes, and from *stachi* in having a distinct lateral tooth on the unguis. It differs from all three by the very low, blunt anal spines, and above all the absence of the unguiculus. The latter character relates the present material to *O. sublamellifera* Denis, 1948, from Vietnam, but that species lacks the lateral teeth on the unguis and has a somewhat different, smaller, postantennal organ. In all other body characters it agrees closely with *O. nana*, and I prefer not to exaggerate the importance of the differences by making another new species.

If I may take the slide from Brunoy as a reference for *nana* s. str., another difference would be the absence of seta m_4 on abd₄ in *nana nana*.

***Xenyllodes minitaurus* n. sp. (Fig. 16 c-e, 17, 18, 19 a-d)**

Material: sample 30: 1♂ ; 36: 1♀ and 1♂ (holotype).

Description. Total length of the only female 0.7 mm; the males are 0.5 and 0.6 mm. Habitus slender, strongly resembling that of a *Mesaphorura*. Basal skin reticulation in a normal, hexagonal lattice (very different from the quadrangular lattice in *Odontella*); skin folded in high conical papillae, which are absent only on the feet and furca. No pigment, but below each eye there is a small aggregation of colourless granules.

Ant₃ with small sensilla in external face. Ant. org. III with two small curved sensillae, and between them two almost imperceptible sense rods (Fig. 18 d). Ant₄ with retractile end bulb, and 6 swollen sense hairs. Hairs at ventral face mainly with a blunt apex (Fig. 16 d).

Eyes 2 + 2, separated by roughly their own diameter. Postantennal organ broadly and a bit irregularly triangular, sunken below the integument in a cavity communicating with the surface via a triangular fissure (Fig. 19 a, b). Mouth parts not studied. Mouth cone typical (Fig. 18 c). Tibiotarsi with some long hairs, which are possibly finely clavate (Fig. 19 d). Unguis strongly curved, without lateral or internal teeth. Unguiculus present, needle-shaped (Fig. 19 c).

Ventral tube with 3 + 3 setae.

Retinaculum bidentate. Manubrium with 2 + 2 setae; dentes almost quadrangu-

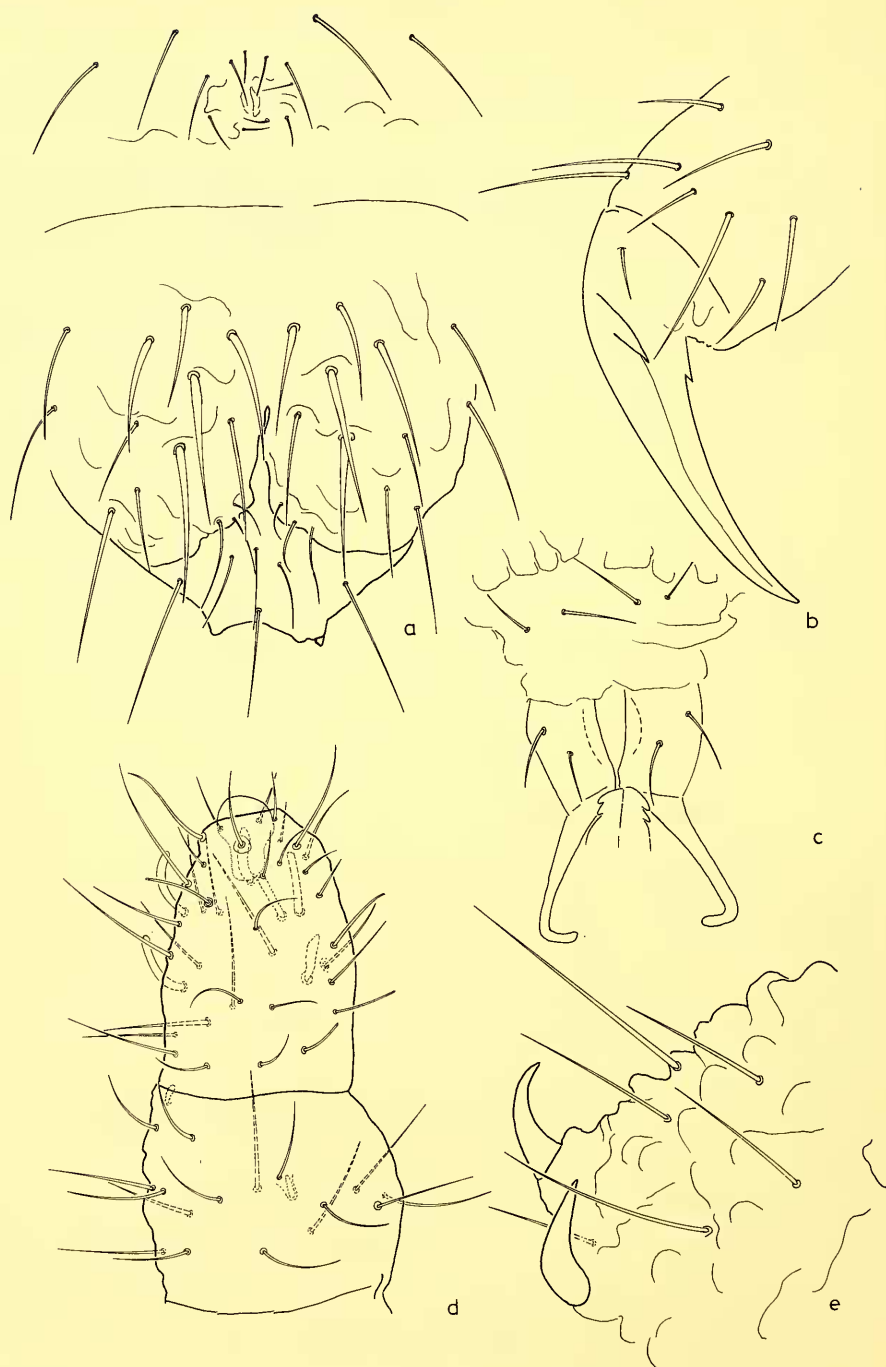


Fig. 16. *Odontella nana orientalis* n. ssp. a, ventral chaetotaxy of genital and anal areas; b, claw of P_2 . *Xenyllodes minitaurus* n. sp. c, furca and retinaculum; d, ant₃₋₄; e, anal spines

lar, smooth, with 2 + 2 setae. Mucro exceedingly long and crook-shaped (Fig. 16 c). Male genital papilla with about 11 setae; female genital orifice with 3 + 3 setae (Fig. 18 a). Two anal spines present, strong and curved, roughly 1.5 times unguis (Fig. 16 e).

Chaetotaxy composed of fine, smooth setae, nowhere differentiated (Fig. 17). Head lacking seta a_0 , with setae p_{2-4} , c_1 , c_{3-4} , d_1 , d_{3-5} , sd_{3-5} , oc_{2-3} . As in *Odontella*, th_1 has 4 + 4 setae. Chaetotaxy of th_2 and th_3 similar: a_{1-3} , m_1 , m_3 , p_{1-2} , p_{3-4} . It is not possible to recognize a seta sensuality in p_4 . Abd_{1-3} with a_1 ; a_{3-5} , p_{1-5} . Abd_4 lacks a

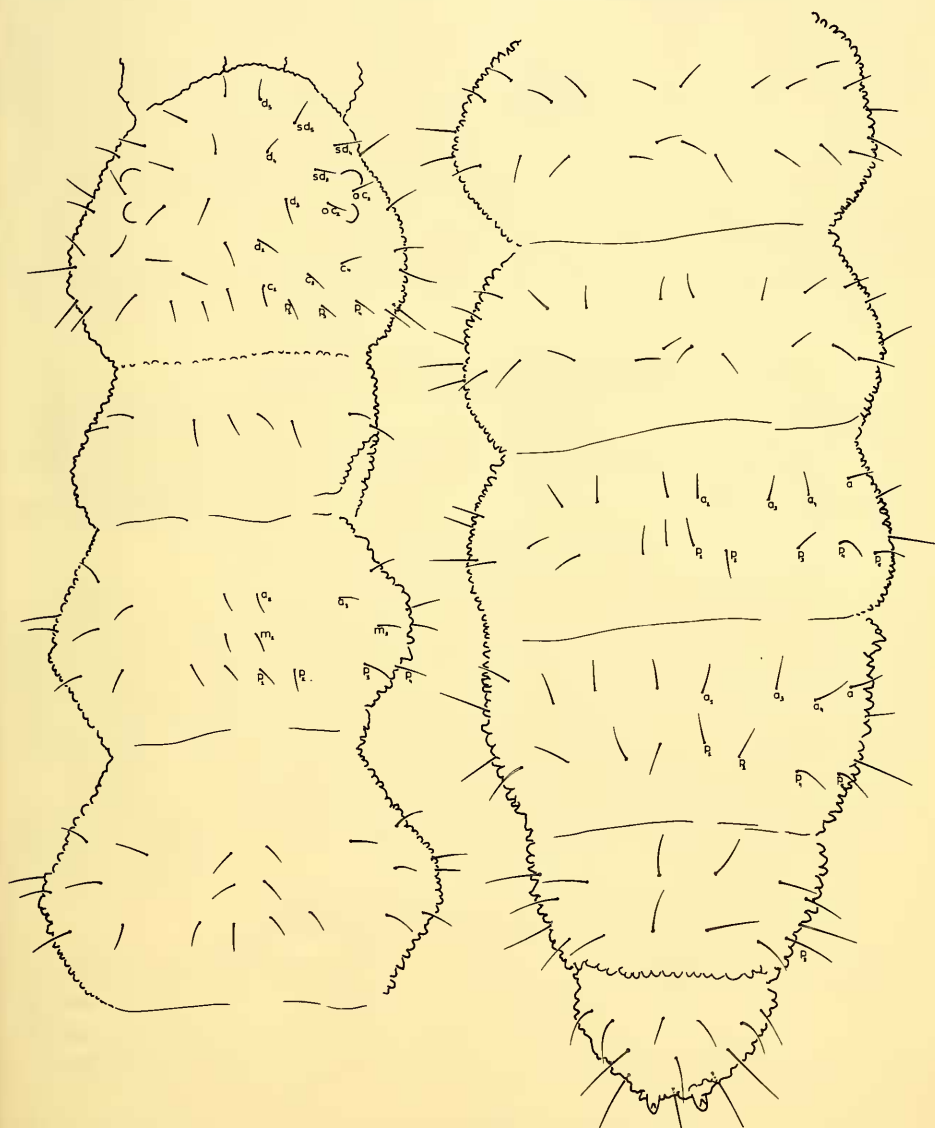


Fig. 17. *Xenyllodes minitaurus* n. sp., dorsal chaetotaxy

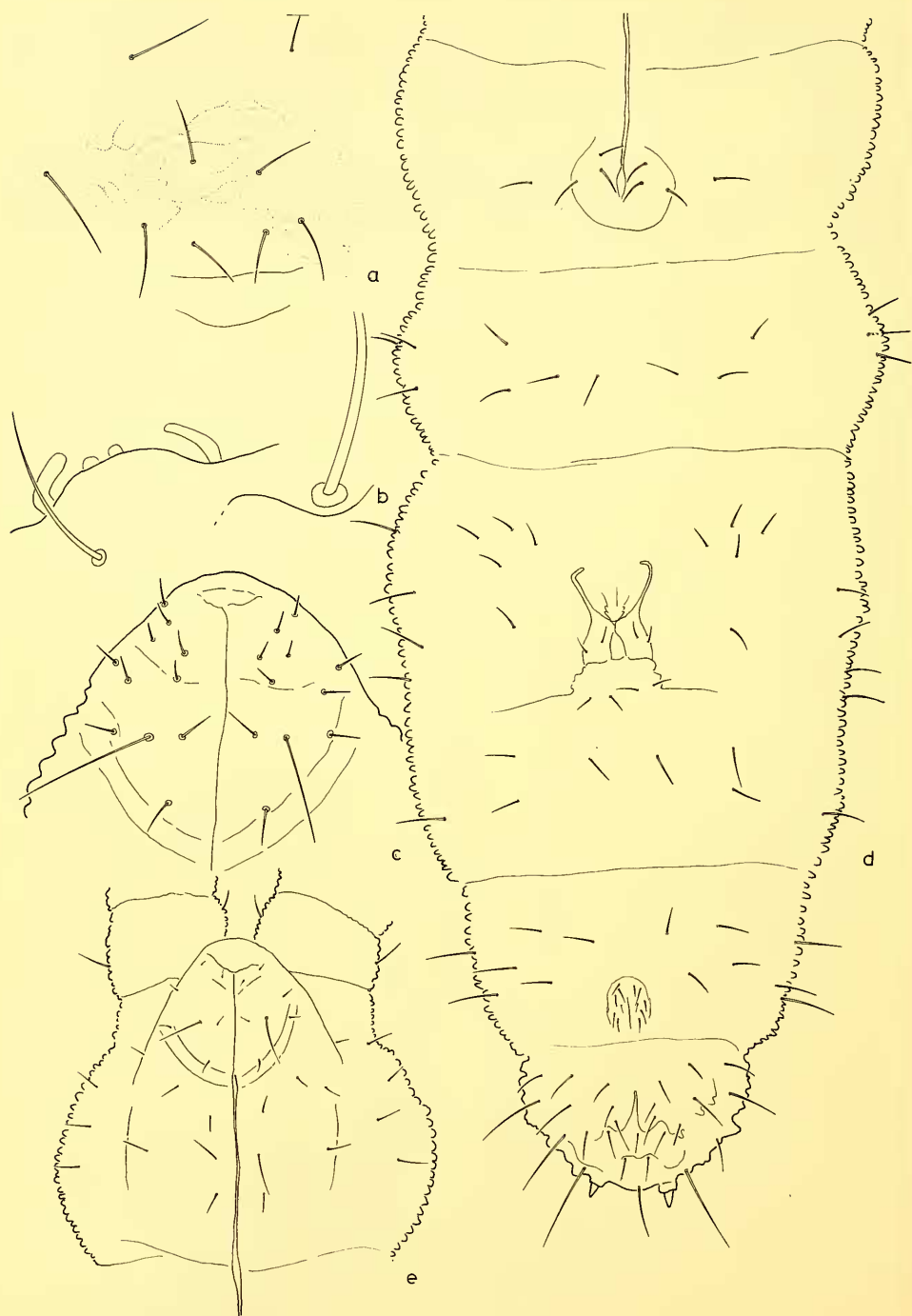


Fig. 18. *Xenyllodes minitaurus* n. sp. a, female genital orifice; b, antennal organ III; c, mouth cone; d, ventral chaetotaxy of abd₁₋₆; e, ventral chaetotaxy of head

row m, and only has a_1 , a_{3-5} , p_{1-2} , p_{4-5} . Abd₅ with a_{1-3} , p_{1-3} . Seta sensualis is, as usual, p_5 in abd₁₋₄ and p_3 in abd₅. Abd₆ with one unpaired seta.

Ventral chaetotaxy of head with a_1 , m_1 , and p_1 , but apparently lacking m_2 (Fig. 18 e). Abd₁ with 1 + 1 seta beside the ventral tube. Abd₂ with 1 anterior seta, and 2 + 3 (2 specimens) or 3 + 3 (1 spec.) setae in posterior row. For the chaetotaxy of abd₃₋₆, I refer to Fig. 18 d.

Discussion. Presently, only two species of *Xenyllodes* having 2 + 2 eyes are known, viz., *bayeri* Kseneman, 1935, from Central Europe, and *X. ghilarovi* Martynova, 1964, very briefly described from the USSR (Kursk). The new species differs from *bayeri* by being much more slender, the large, triangular, sunken postantennal organ, the dentes not being tuberculate, and the subempodial setae being much longer. *X. ghilarovi* is differentiated from *bayeri* rather concisely: "Postantennal organ large, triangular. Body without pigment". The only accompanying drawing shows two eyes set fairly close to each other (separated by less than half eye diameter) and the postantennal organ superficial.

The name was chosen not only because part of the material was collected in Knossós, the palace of the Minotauros, but also because I was reminded of this legendary being by the shape of the mucro, which has some resemblance to the emblem of the holy bull.

***Brachystomella parvula* (Schäffer, 1896)**

Material: sample 16: 2 ♀ and 1 ♂; 17: 1 juv.; 27: 7 ♀, 4 ♂, and 2 juv.; 36: 4 ♀; 41: 4 ♀ and 1 juv.; 42: 1 ♀; 43: 1 juv.; 45: 3 juv.

This material will be dealt with by Dr. Z. Massoud and Dr. J. Najt, who are preparing a revision of this species.

***Friesea afurcata* Denis, 1926**

Introductory remarks. The Cretan material contained a fine series of this species. It was, however, by no means homogeneous material and at a first glance seemed to comprise three species, but since the differences were not considered sufficiently important, I preferred to treat the variants as three types of the same species. They are possibly to be explained by differences in post-adult development; I found no indications for an explanation in terms of ecomorphosis.

It is interesting to compare this variability with the results of Grow & Christiansen (1974), which unfortunately did not become available to me until after the completion of the present study.

***Friesea afurcata* Denis, 1926, type I (Fig. 19 e-g, 20)**

Material: sample 41: 11 ♀ and 3 ♂; 49: 1 ♀; 1 ♀ from sample 41 was partially, and 2 ♀ and 2 ♂ were wholly depigmented by treatment with HCl—KClO₃. One of the depigmented ♀ was squashed for a study of the mouth parts.

Description. Mean total length of 10 ♀ from sample 41 is 1.63 mm ($s=0.14$ mm, $s_x=0.04$ mm); mean length of 3 ♂ is 1.31 mm ($s=0.28$ mm, $s_x=0.16$ mm). Difference in size between the sexes significant ($t=2.853$, $df=11$, $0.02>P>0.01$). The single ♀ from sample 39 measures 1.2 mm. Irregular bluish-grey pigmentation dis-

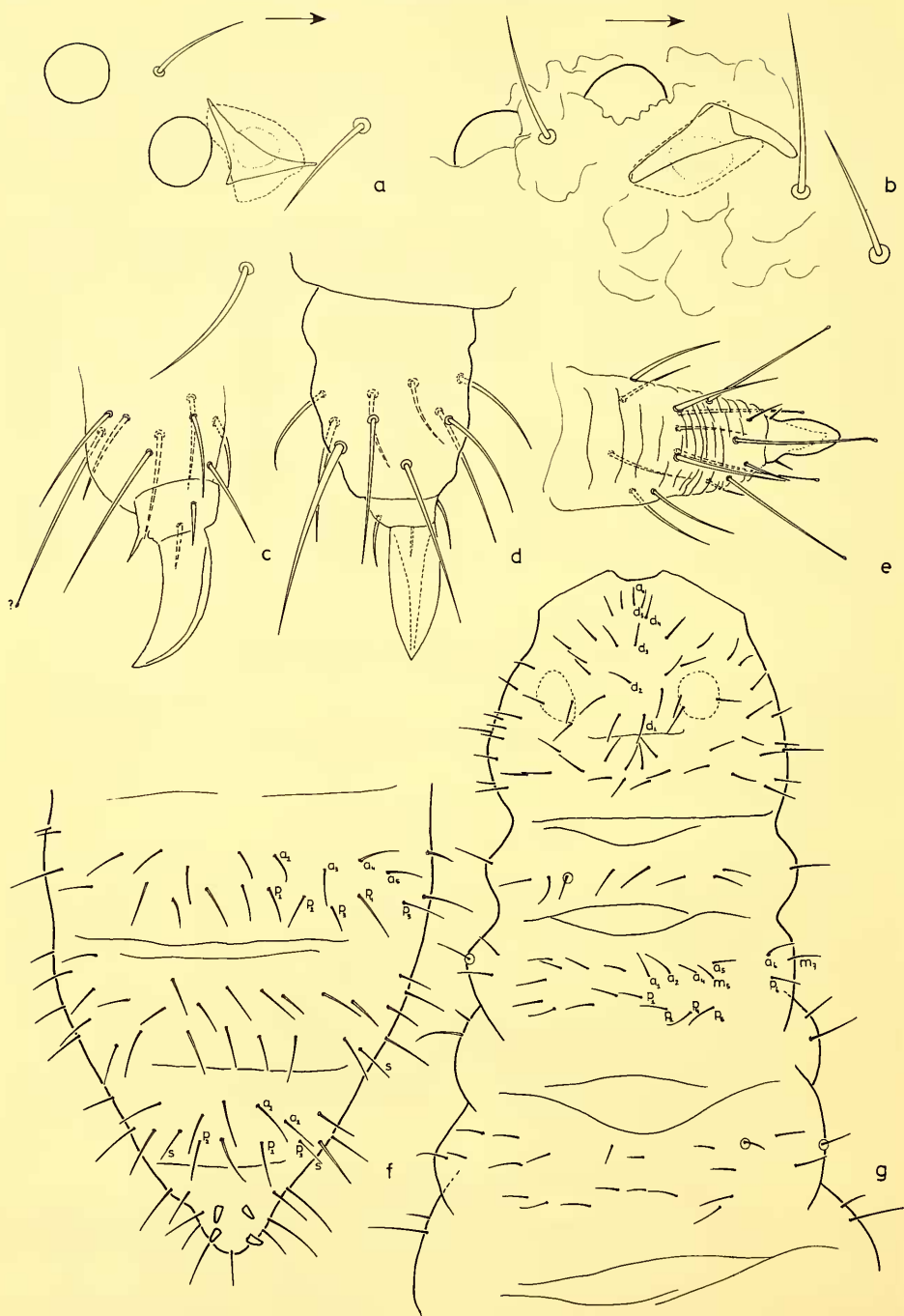


Fig. 19. *Xenyllodes minitaurus* n. sp. a, eyes and postantennal organ in perpendicular view; b, the same, oblique view; c, claw of P_1 ; d, tibiotarsus of P_1 . *Friesea afurcata* Denis type I. e, tibiotarsus of P_2 ; f, dorsal chaetotaxy of abd_{3-6} ; g, dorsal chaetotaxy of head and thorax. (Encircled hair bases refer to setae missing in the specimen from which the drawing was made.)

persed all over the body, less densely in ventral region. Eye patches dark. Integumentary granulation rather fine and regular, in abd₆ a bit coarser.

Ant₄ with retractile apical papilla, distinct strongly curved swollen sense hairs, and a number of setiform sense hairs. Ventro-distally there is a group of about eight short blunt sense hairs. Suture between ant₃ and ant₄ only visible ventrally (Fig. 20 a). Ant₃ with antennal organ normal; two small, parallel, rectangularly curved sense clubs in a shallow groove, guarded by two thickened sense hairs ca. 7—8 μ long (Fig. 20 c). Eyes 8 + 8. Maxilla typical (Fig. 20 f); mandible with 3 strong basal teeth, 3 smaller distal teeth with a small fourth one, and a tooth associated with the corpus of the mandible (Fig. 20 g).

Unguis with a tooth in the middle of the internal lamella, which is, however, sometimes indistinct or missing; lateral carinae without teeth. Unguiculus absent. Two inner and two outer tenent hairs with a barely perceptible distal dilatation (Fig. 19 e).

Ventral tube with 4 + 4 setae; retinaculum and furca completely absent. Male genital papilla with about 25 setae, female genital orifice with about 15 associated hairs. Anal spines 4, strong, almost straight, arranged in a square, totally differentiated from normal hairs (Fig. 20 b).

Dorsal chaetotaxy (Fig. 19 f, g) composed of coarse, long, distinctly rugose setae (ventral chaetotaxy composed of smooth smaller hairs). Cephalic chaetotaxy with setae p₁₋₄, c₁₋₄, a₀, d₁₋₅ (d₂ is unpaired), sd₁₋₅, oc₁₋₃. No setae v. Th₁ with 4 + 4 setae. Th₂ with a₁₋₂, a₄₋₆, m₅, m₇, p₁₋₂, p₄₋₆; p₄ = ss. Th₃ differs from th₂ only but constantly by lacking a₂. Subcoxae with 1, 2, 2 setae. Abd₁₋₃ with a₁, a₃₋₅, p₁₋₅; p₅ = ss. Chaetotaxy of abd₄ is rather irregular, especially in the a row. It seems as though normally a₁₋₅ are present. In the posterior row the normal situation is: p₁₋₂, p₄₋₅; p₅ = ss. In abd₅ a₁₋₃ are present, as well as p₁₋₃. Very often not p₃ (the normal case) but p₂ = ss; in the present material this only happens asymmetrically, but this might explain the situation illustrated by Da Gama (1964) for *F. afurcata*, where p₂ is ss at both sides of abd₅.

Ventral chaetotaxy of head with only a₁ and m₁ (Fig. 20 e); thoracic sternites and abd₁ not chaetose. Abdominal sternites 2-4 with a large number of setae which are difficult to homologize (Fig. 20 d).

Diagnosis. On the basis of the keys of Gisin (1960) and Massoud (1967) one would identify the present species as *F. afurcata* Denis, 1926. This species was described from Italy, and was later reported from Germany and Austria. The species was recorded from the Lebanon by Cassagnau & Delamare Deboutteville (1955). The types have been studied in as much detail as was still possible by Da Gama (1964) in connection with a redescription of *F. ladeiroi* Da Gama, 1959. Quite recently, Dallai (1973), in connection with the description of the related *F. lagrecai*, provided additional details after topotypical material of *afurcata*. From all this it can be inferred that the Cretan material is, to say the least, very close to *afurcata*; possibly important differences are in the tenent hairs — in the Greek specimens much less distinctly clavate than as drawn by Dallai — and in the chaetotaxy of abd₄. Although some ambiguity exists, partly due to different interpretations of the chaetotaxy, Cretan *afurcata* seem to have one more seta in the p row.

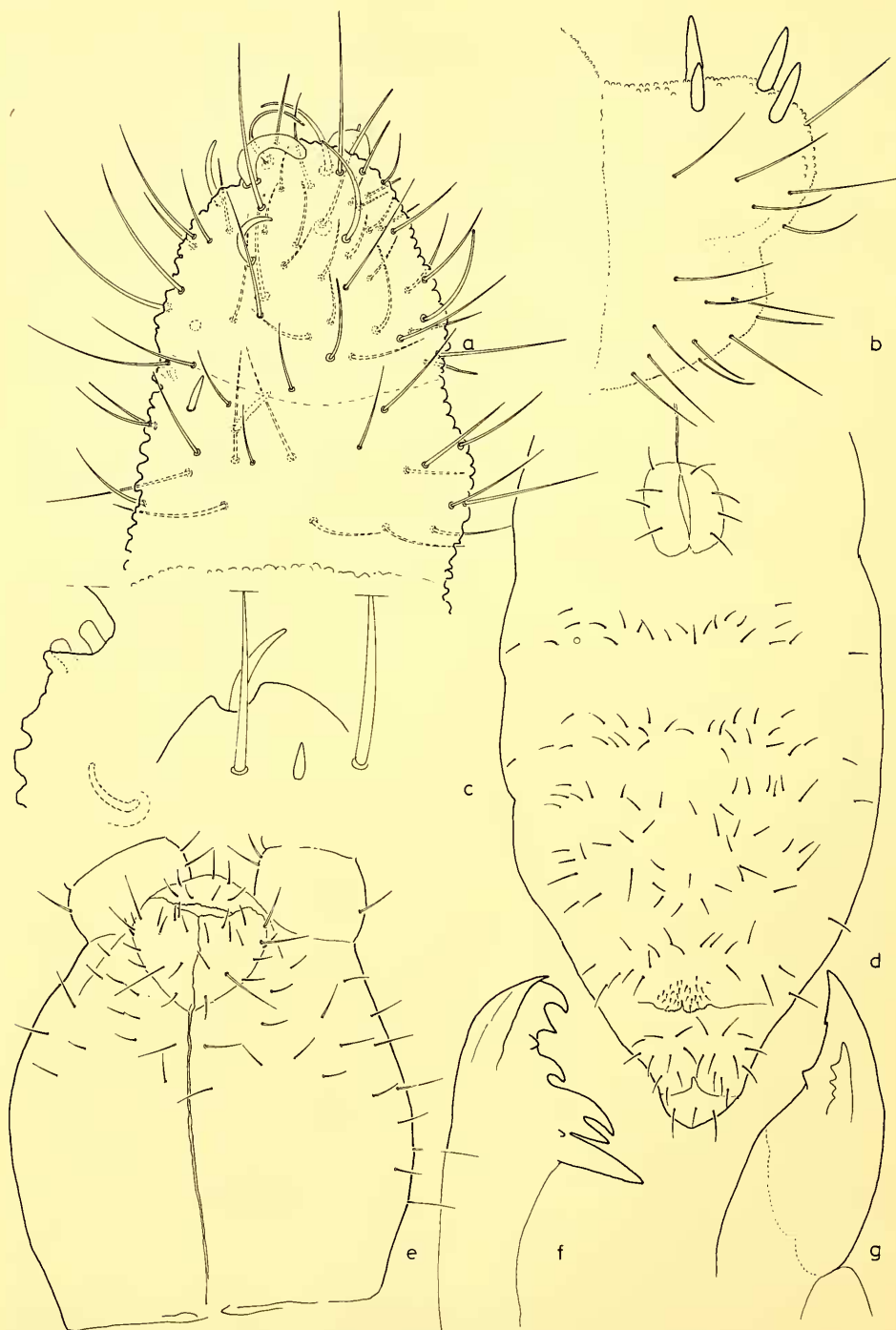


Fig. 20. *Friesea afurcata* Denis, type I. a, ant₃₋₄; b, lateral aspect of abd₆; c, antennal organ III; d, ventral chaetotaxy of abd₁₋₆; e, ventral chaetotaxy of head; f, mandible; g, maxilla

Another species which seems very close to the present material is *Colonavis grandis* Salmon, 1949 (= *Friesea salmoni* Massoud, 1967, nom. nov. pro *F. grandis* (Salmon, 1949) nec Mills, 1934) from Campbell Island.

***Friesea afurcata* Denis, 1926, type II (Fig. 21, 22 a)**

Material: sample 16: 1 ♀; 26: 1 ♀ and 2 ♂; 36: 15 ♀, 10 ♂, and 1 specimen of unknown sex - squashed; 43: 1 ♀.

Discussion. This material differs from what I have provisionally called „type I” in the following characters:

(a) in the chaetotaxy of th_2 and th_3 the m row has no setae — normally! In at least one specimen th_3 has a distinct m_s , in a symmetrical position (Fig. 21 d);

(b) in abd_s , $p_2 = ss$ (Fig. 21 a);

(c) the anal spines are much more slender or, in other words, less differentiated from normal setae;

(d) the abdominal setae are more slender, shorter, and much less rugose; often it is hard to find any rugosity;

(e) the integument of abd_6 is distinctly more coarsely granulated than that of the rest of the body; this is very striking, and visible at rather low magnifications;

(f) the ventral chaetotaxy of abd_1 and abd_2 is much less dense (Fig. 22 a);

(g) lateral sensillae of ant. organ III longer compared to body of ant_4 and to length of guarding setae (Fig. 21 b);

(h) the specimens are much smaller; the mean total length of the females from sample 36 is 0.71 mm ($s = 0.05$ mm, $s_{\bar{x}} = 0.02$ mm), of the males 0.62 mm ($s = 0.06$ mm, $s_{\bar{x}} = 0.02$ mm); the difference in size between the sexes is significant ($t = 3.481$, $df = 23$, $0.01 < P < 0.001$); the specimens from the smaller samples lie in the same range.

The last character could be interpreted as an indication of immaturity of the material, but most of the males show active internal genitalia and testicular tissue. However, the otherwise close similarity to *afurcata* (number of anal spines, total reduction of retinaculum and furca, number of eyes, etc.) is such that I prefer provisionally to put more emphasis on the relationship between the forms around *afurcata* rather than to separate them by creating different species. Moreover, some of the characters may be related to allometric growth (structure of setae, anal spines, chaetotaxy of abdominal sternites 1 and 2), and I cannot exclude the possibility that material of type I is somewhat older than that of type II. It may be significant that Gisin (1960) mentioned for *afurcata* the unusual wide length interval of 0.8-1.6 mm.

***Friesea afurcata* Denis, 1926, type III (Fig. 22 b, c)**

Material: sample 2: 1 ♂; 40: 4 ♀ and 4 ♂.

Discussion. This material comes closest to “type II”. The mean size for the ♀ is 0.7 mm, for the ♂ 0.6 mm. This sex difference is not significant. The sensillae lateral to antennal organ III are long, even somewhat undulate. The tibiotarsal tenent hairs are even more weakly differentiated. The integument of abd_6 is

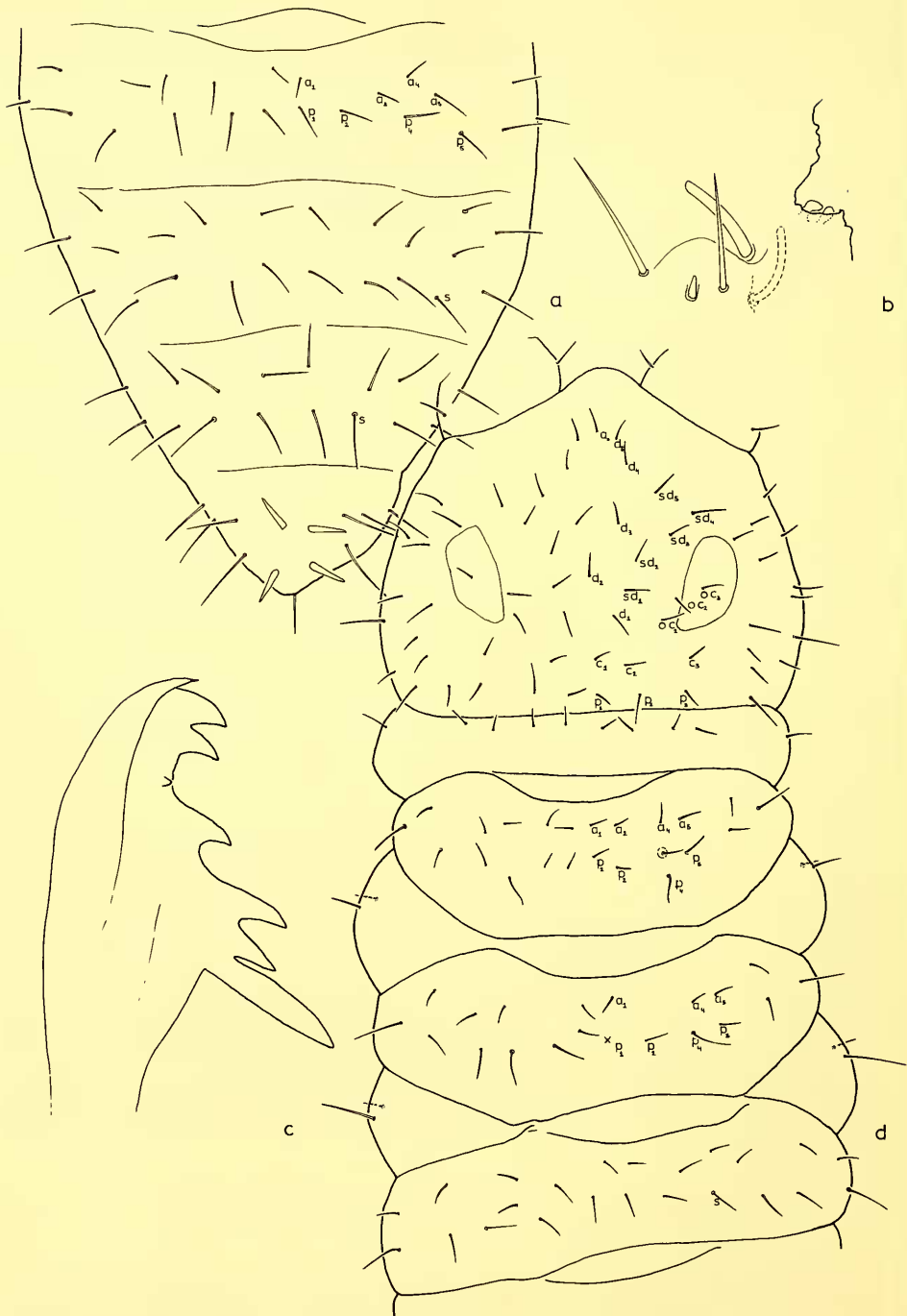


Fig. 21. *Friesea afurcata* Denis, type II. a, dorsal chaetotaxy of abd₃₋₆; b, antennal organ III; c, mandible; d, dorsal chaetotaxy of head, thorax, and abd.; an x indicates a hair missing in the actual specimen, an encircled seta is lacking in the remainder of the specimens

differentiated in the same way, i.e., coarsely granulated. However, I am forced to place it in a type of its own — if not a species — since the setae a_2 on abd_6 are spiniform, and just as strongly as a_1 or p_1 . This brings the present material close to *F. ladeiroi* Da Gama, 1959, described from Madeira, and differentiated from *F. afurcata* by having six anal spines (shaped just like those of my *afurcata* III), the setae almost completely smooth, and only one tenent hair which is not clavate. In

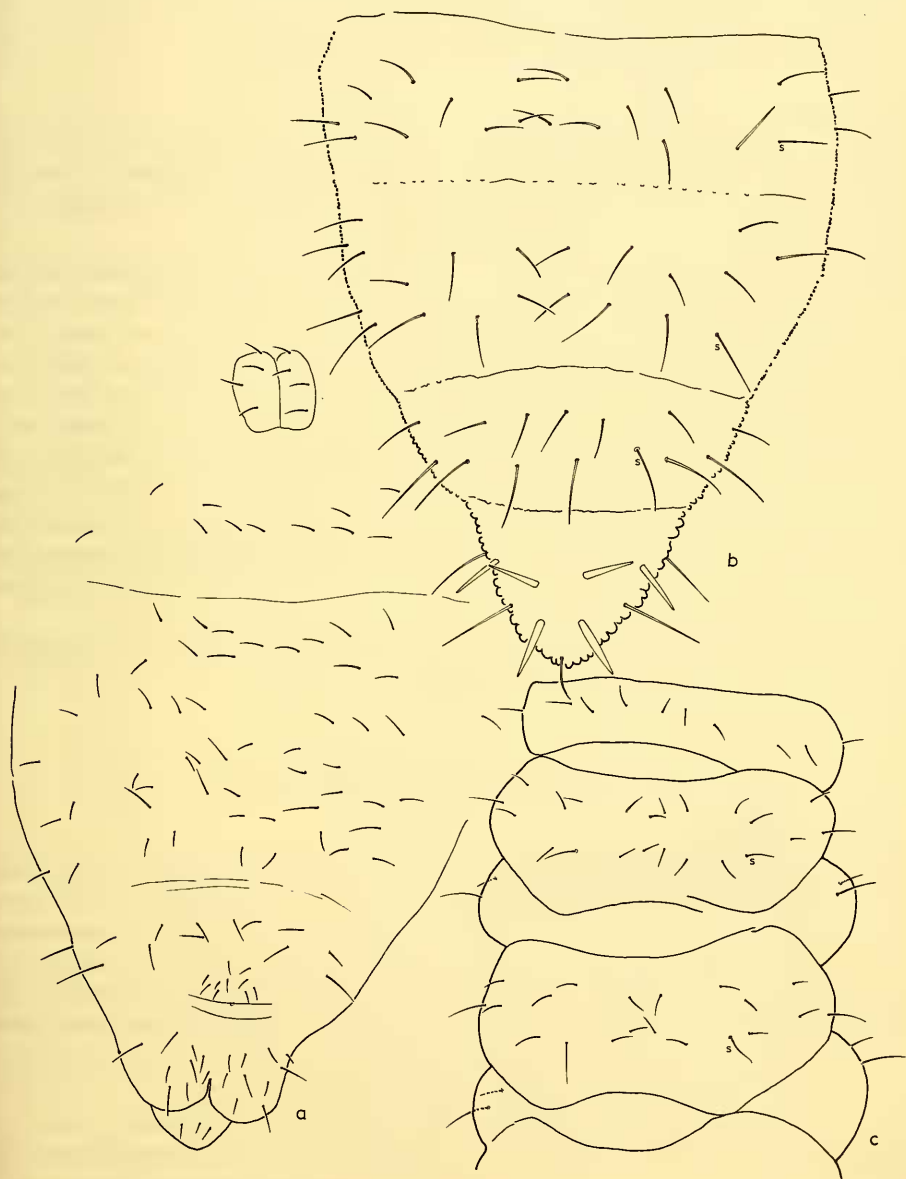


Fig. 22. *Friesea afurcata* Denis, type II. a, ventral chaetotaxy of abdomen. *Friesea afurcata* Denis, type III. b, dorsal chaetotaxy of abd_{3-6} ; c, dorsal chaetotaxy of thorax

1964, Da Gama added to these characters: absence of setae a_2 in abd_5 and perhaps the absence of a_3 in th_{2-3} . *F. afurcata* III remains distinct from *ladeiroi* in possessing a_2 on abd_5 , and moreover in having a_3 , but missing m_3 , in th_{2-3} (I admit that if inserted a bit more caudad, the seta which is present might just as well be called m_3 ; but a_3 and m_3 are not present at the same time anyway).

Friesea decipiens Steiner, 1958 (Fig. 23 a, b)

Material: sample 25: 5 ♀ and 3 ♂.

Discussion. This species, described from Spain has recently been found by Dallai (1969 b, 1973) and Rusek (1973 b) in Italy. The species seems to have a Mediterranean distribution. Supplementary to the description by Steiner and the drawings by Rusek, I give some descriptive notes.

Mean length of the females 0.7 mm ($s = 0.07$ mm, $s_{\bar{x}} = 0.03$ mm); mean length of the males 0.6 mm ($s = 0.02$ mm, $s_{\bar{x}} = 0.01$ mm). Cephalic chaetotaxy as illustrated for *F. afurcata*. Thoracic chaetotaxy differs by the absence on th_{2-3} of m_3 ; at the same time, a_3 is displaced somewhat caudad, being inserted almost at the place of m_3 . Abd_{1-3} with a_1 , a_{3-5} , p_{1-2} , p_{4-5} ; $p_4 = ss$. Abd_4 with 3+3 setae in the a row before the 4+4 in the p row. Abd_5 lacks a_2 and p_2 is ss . Seta p_1 rather long and stiff; seta a_1 and a_3 distinctly longer than drawn by Rusek. The median anal spine is usually smaller than the lateral ones, and mostly but not always, almost straight (Fig. 23 b). Ventral chaetotaxy of head with a_1 and m_1 ; thorax and abd_1 ventrally achaetose. Ventral chaetotaxy of abd_{3-4} rather imperfectly symmetrical (Fig. 23 a). All body setae very fine and smooth, except p_1 on abd_5 which is a bit coarser though still smooth. Subcoxae 1, 2, 2.

The material is in good agreement with the description by Steiner except that the unguis is provided with a distinct inner tooth.

Tremoisea cf. ossica Cassagnau, 1973 (Fig. 23 c-e)

Material: sample 45: 1 ♂.

Discussion. It was a pleasant surprise to find a representative of the genus *Tremoisea*, described in 1973 by Cassagnau for a species from Kérkira and another from the Greek mainland, not far from Lárissa. The single specimen, measuring 1.5 mm, had its intestine filled with some dark-blue (clay?) material, showing up an unexpected array of what seem to me to be intestinal diverticula (Fig. 23 e). However interesting these may be, they impeded closer study of the specimen. But all essential traits necessary for the generic allocation are distinct: the strange mouth cone (Fig. 23 d), the multidentate mandible and the elongate Frieseinae-type maxilla, the complete eye patch, albeit lacking the postantennal organ, the abundant chaetotaxy, and so on. However, it seems to me that the chaetotaxy of my single specimen, as far as this could be studied, was not perfectly symmetrical. From the structure of the unguis (Fig. 23 c) it is evident that in any case the specimen comes close to *T. ossica*, described from Thessalía.

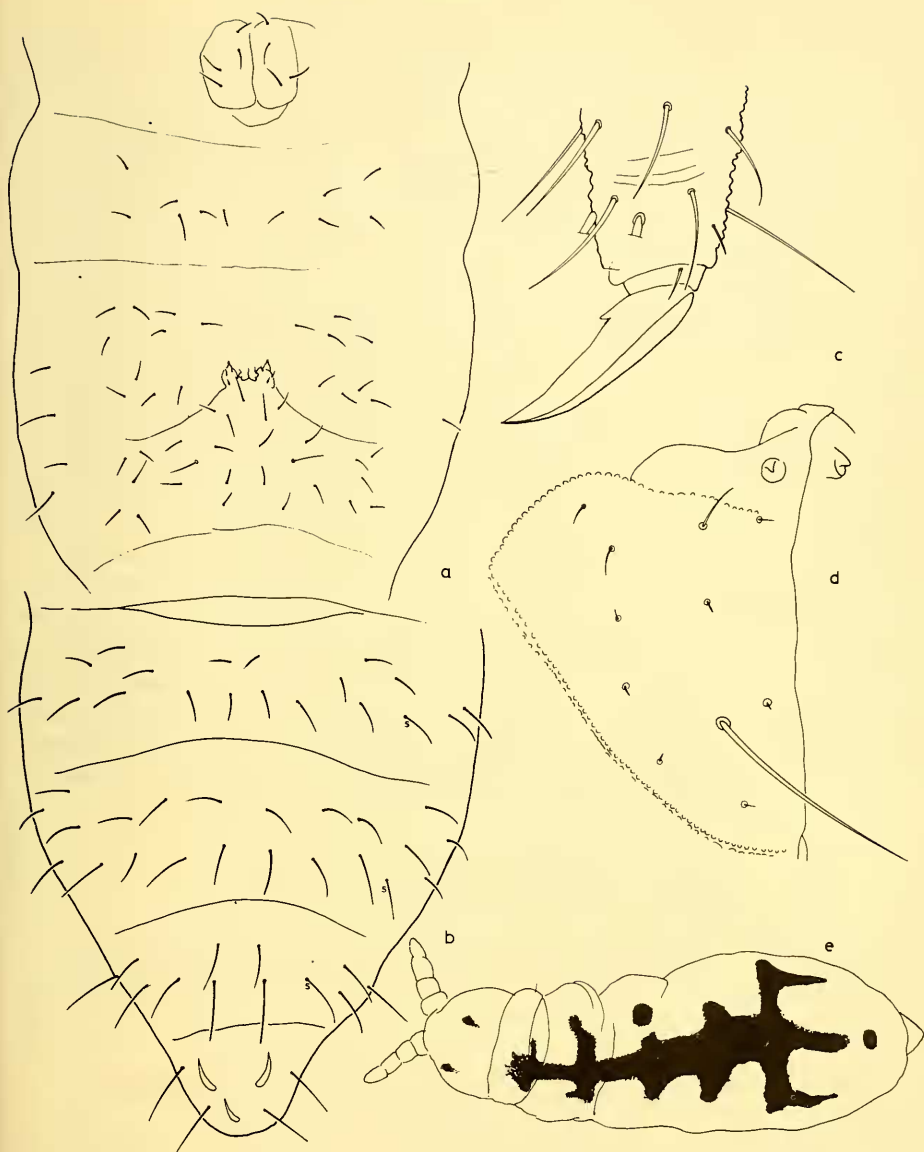


Fig. 23. *Friezea decipiens* Steiner. a, ventral chaetotaxy of abd_{1-4} ; b, dorsal chaetotaxy of abd_{3-6} . *Tremoisea* cf. *ossica* Cassagnau. c, claw of P_1 ; d, mouth cone; e, habitus of cleared specimen (to show intestinal diverticula)

***Pseudachorutella* cf. *asigillata* (Börner, 1901) (Fig. 24)**

Material: sample 21: 1 juv., depigmented by $HCl-KClO_3$ treatment; 35: 1 juv., squashed for observation of mouth parts.

Description. Length 0.6 mm; irregular not very strong greyish-blue pigment on dorsum and extremities. Habitus normal. Skin granulation moderate. Antenna₄

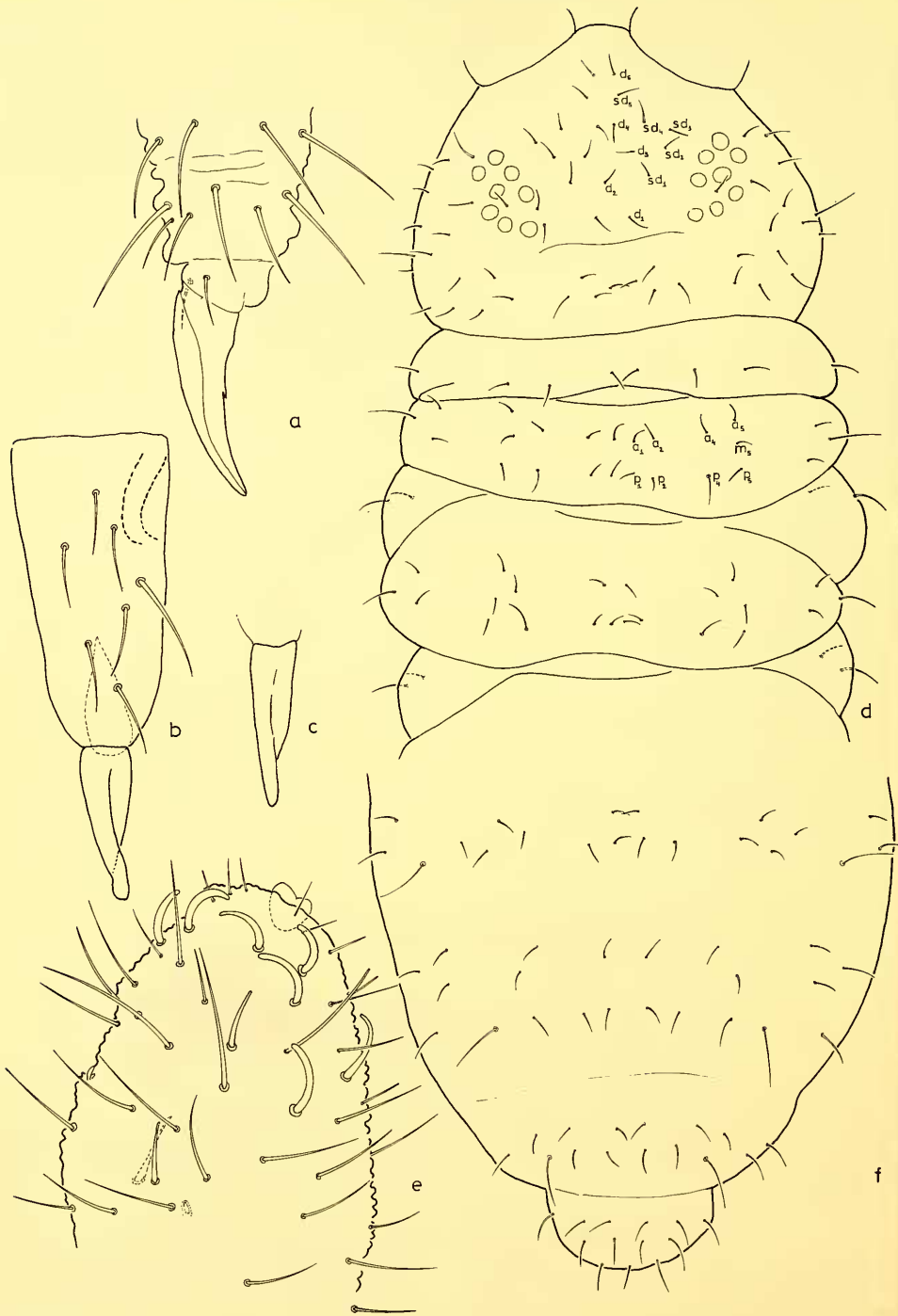


Fig. 24. *Pseudachorutella* cf. *asigillata* (Börner). a, claw of P_1 ; b, posterior face of mucrodens; c, micro; d, dorsal chaetotaxy of head and thorax; e, ant₃₋₄; f, dorsal chaetotaxy of abd₃₋₆

with apical retractile papilla superficially trilobed, and with 8 rather slender, strongly curved sense hairs; no sensory rasp. Ant₃ with 2 small sensillae (I could not make out whether they are straight or curved) guarded by two comparatively slender sense hairs; a small sensilla in a groove ventrally in ant₃ (Fig. 24 e). Eyes 8 + 8 in a well pigmented eye spot. Postantennal organ absent. Mouth cone long; mandible in one specimen three-toothed; maxilla with two lamellae, one with a small distal hook, at least the last third free. No differentiated tenent hairs. Unguiculus absent, unguis rather slender, with a small inner tooth, but without lateral teeth (Fig. 24 a).

Ventral tube with 4+4 setae. Retinaculum tridentate. Dens with 7+7 setae, mucro elongate, straight, with a narrow inner lamella gradually narrowing towards apex (Fig. 24 b, c). No anal spines.

Chaetotaxy composed of short, smooth, nowhere clavate setae; setae sensuales well differentiated. Cephalic chaetotaxy with p and c row difficult to separate, d₁₋₅ (d₂ unpaired), sd₁₋₅; a₀ absent; oc₁₋₃ (Fig. 24 d). Th₁ with 3 + 3 setae. Th₂ with a₁₋₂, a₄₋₅, m₅, p₁₋₂, p₄₋₅; p₄ = ss. Th₃ similar but lacking a₂. Abd₁₋₃ with a₁, a₃₋₄, p₁₋₅; p₅ = ss.

Abd₄ with a₁, a₄, m₄, p₁₋₂, p₄₋₅; p₅ = ss. Abd₅ with a₁₋₃; p₁₋₃; p₃ = ss (Fig. 24 f).

Discussion. This material, which is very similar to that which I recorded earlier (Ellis, 1974) from Rhodes, and also shares the inconvenience of being very young, is a bit difficult to interpret. It differs in one chaetotactic detail from *asigillata* as drawn by Da Gama (1964) viz., in the presence of a seta p₂ in abd₅. Moreover, the shape of the straight mucro, with its narrow, apically unnotched lamella, has little resemblance to that of *asigillata*. Finally, the observation of a three-toothed mandible is suggestive — but nothing is known about possible variability in this structure. I am awaiting adult material before making a decision.

***Pseudachorutes dubius* Krausbauer, 1898**

Material: sample 27: 1 juv.; 35: 1 ♂.

The species has already been recorded from Greece (Evvia, Cassagnau, 1971; Rhodes, Ellis, 1974).

***Pseudachorutes libanensis* (Cassagnau & Delamare Deboutteville, 1955) n. comb. (Fig. 25, 26 a-c)**

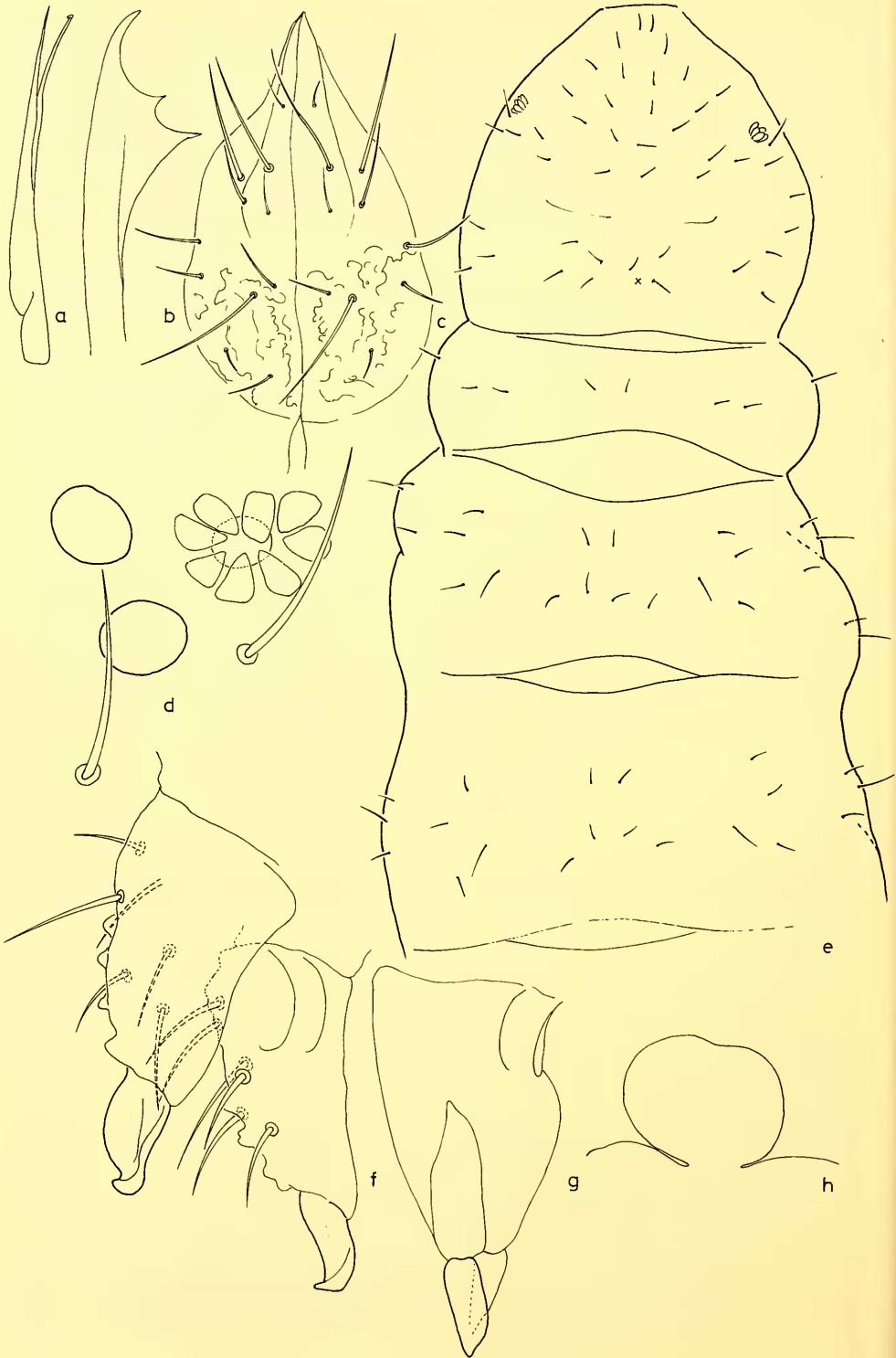
Aethiopella libanensis Cassagnau & Delamare Deboutteville, 1955.

Material: sample 17: 1 juv.; 32: 4 ♀ and 3 ♂; 48: 2 ♀.

Description. Mean length of the six females 0.8 mm (s = 0.16 mm, s_x = 0.07 mm), that of the 3 males 0.7 mm (s = 0.10 mm, s_x = 0.06 mm).

Skin granulation normal for the genus, greyish-blue pigment, not particularly dark, scattered over dorsal parts of body.

Ant₄ with apical bulb "apple-like": almost globular, but with a slight apical invagination (Fig. 25 h). Outer side of this antennomere with 2, inner side with 6 moderately thick curved sense hairs. Antennal organ III consists of two small,



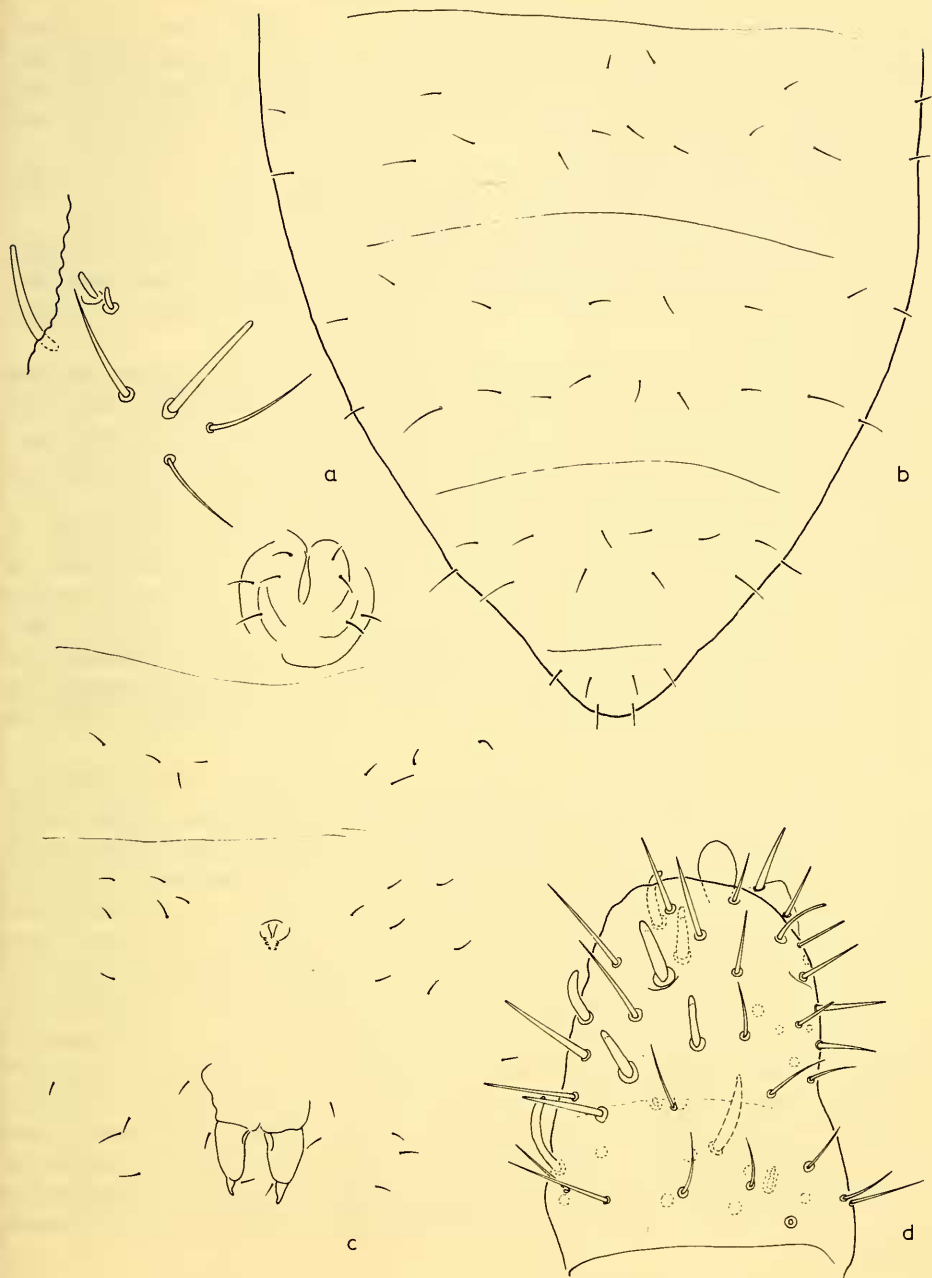


Fig. 26. *Pseudachorutes libanensis* (Cassagnau & Delamare). a, antennal organ III; b, dorsal chaetotaxy of abd₃₋₆; c, ventral chaetotaxy of abd₁₋₄. *Pseudachorutes (Pratanurida) mucronata* n. sp. d, ant₃₋₄

Fig. 25. *Pseudachorutes libanensis* (Cassagnau & Delamare). a, maxilla; b, mandible; c, mouth cone; d, postantennal organ; e, dorsal chaetotaxy of head and thorax; f, furca; g, anterior face of mucrodens; h, apical papilla of antenna

straight (or almost so) sensillae, guarded by two long, slightly wavy sense hairs (Fig. 26 a). Ocelli 8 + 8. Postantennal organ with about 8 elements (Fig. 25 d). Mouth cone as long as typical for the genus (Fig. 25 c). Mouth parts studied only in transparency, normal for the genus with a needle-shaped maxilla (Fig. 25 a) and a two-toothed mandible (Fig. 25 b).

Tibiotarsus without differentiated tenent hairs. Unguis without teeth, or (seen once) with a very feeble tooth on inner lamella. Unguiculus absent.

Ventral tube with 4 + 4 setae; retinaculum tridentate. Dens with 6 + 6 setae (Fig. 25 f, g). Mucro crooked, and with inner lamella more developed than outer one. Dens with characteristic elongate area on anterior surface where the skin reticulation is missing.

Chaetotaxy composed of very short, smooth, never capitate setae. On the head are present p_{1-2} (p_1 is sometimes missing), c_{1-2} , d_{1-5} , sd_{1-5} ; a_0 and v are missing. In d row no unpaired setae. Th_1 with 3 + 3 setae. Th_{2-3} identical, with a_1 , a_{4-5} , p_{1-2} , p_{4-5} ; $p_4 = ss$ (Fig. 25 e). In abd_{1-3} are present a_1 , a_4 , p_{1-2} , p_3 , p_5 . In abd_4 we have a_1 , a_3 , a_5 , and p_{1-2} , p_{4-5} . Abd_5 with a_{1-3} and p_1 , p_3 ; $p_3 = ss$ (Fig. 26 b). No anal spines.

Discussion. The present material agrees closely with the description of *Aethiopella libanensis*, based on a single specimen from Beirut, except of course in the structure of the postantennal organ, which is said to be moruliform in the type specimen. However, even the description leaves some uncertainty as to this point, and in one of the two aspects of the postantennal organ drawn by the authors, it is almost completely pseudachorutiform. I am therefore convinced that *libanensis* was incorrectly allocated, presumably because it was described after a defective specimen.

The species comes close to *Pseudachorutes parvulus* Börner, 1901, *P. subcrassus* Tullberg, 1871, *P. crassus* Da Gama, 1964, *P. geronensis* (Massoud, 1963), and *P. pratensis* Rusek, 1973. *P. libanensis* differs from the first three species in the absence of seta a_2 in th_2 , and also in the combination of characters: no unpaired seta in d row on head, and abd_5 carrying setae a_{1-3} , p_1 , p_3 . The main differences with respect to *geronensis* are the normal mouth cone (that of *geronensis* is very short for the genus), the straight sensillae in the ant. org. III, and the structure of the mucro. Possibly, the chaetotaxy of abd_5 is also different in *geronensis*. *P. libanensis* is most closely related to *P. pratensis* Rusek, 1973. The chaetotaxy of these two species seems to be identical. Differences concern the larger number of sense hairs in ant_4 (4 in *pratensis*), the shape of the sensillae in the antennal organ III (short, distally swollen clubs in *pratensis*, straight rodlets in *libanensis*), and especially the form of the mucro, which is normal for the *parvulus* group in *pratensis* but hooked in *libanensis*. Useful distinctions are perhaps offered by the slightly larger number of elements in the PAO and the distinct tooth on the unguis in *pratensis*.

***Pseudachorutes (Pratanurida) mucronata* n. sp. (Fig. 26 d, 27, 28 a-c)**

Material: sample 17: 1 ♀ (holotype); 36: 1 ♀.

Description. The holotype female measures only 0.4 mm; the other specimen is 0.6 mm. Both specimens have the genital orifice open, but provided with only a few setae, and it is possible that they are not completely mature. Pigmentation

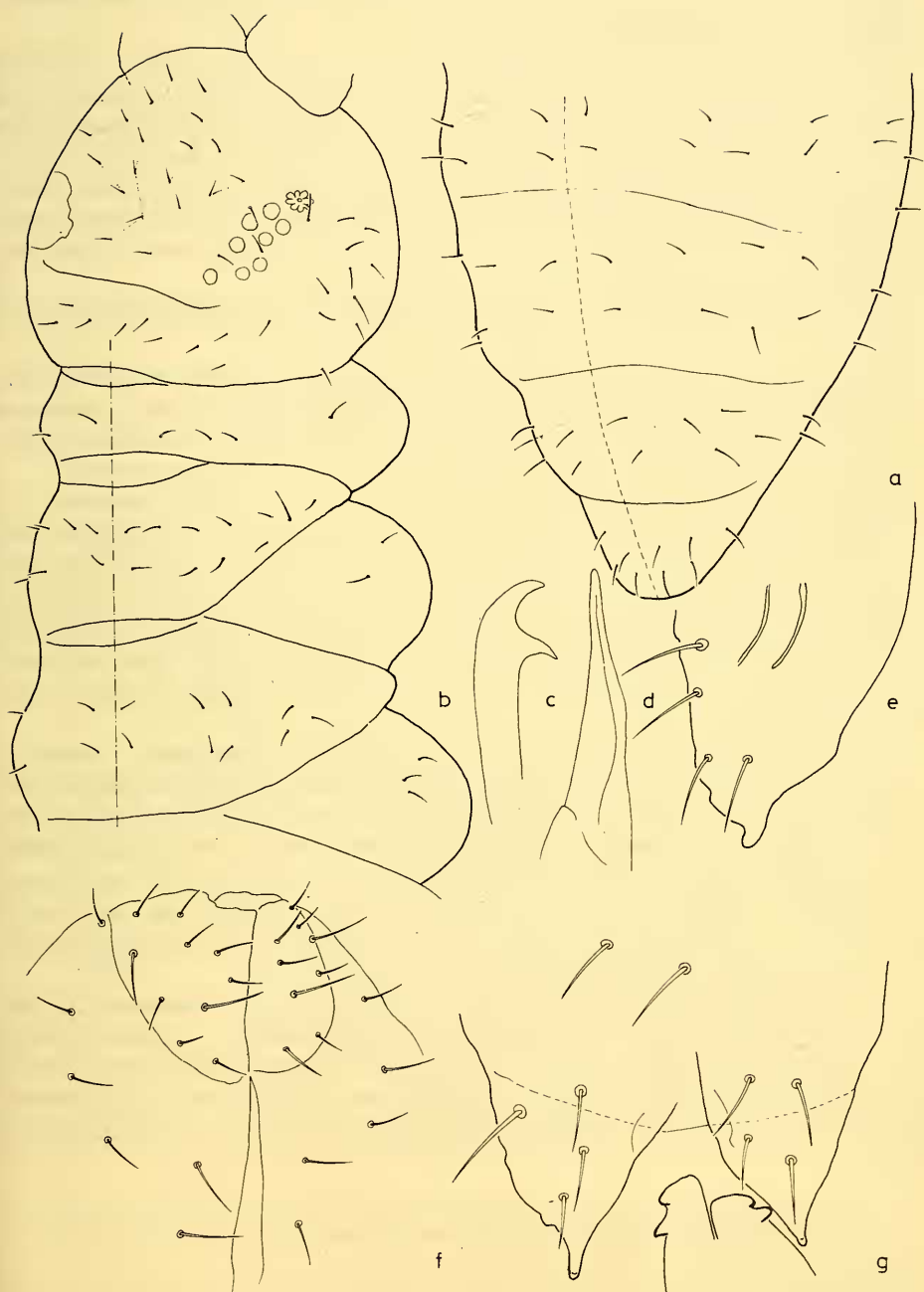


Fig. 27. *Pseudachorutes (Pratanurida) mucronata* n. sp. a, dorsal chaetotaxy of abd_{3-6} ; b, dorsal chaetotaxy of head and thorax; c, mandible; d, maxilla; e, mucrodens in lateral aspect; f, ventral chaetotaxy of mouth region; g, furca and retinaculum

greyish-blue, but particularly strong. Eye patch darker. Integument finely and regularly reticulate, as in *Pseudachorutes* s.s.; no *Neanura*-type reticulation present. Habitus as in a normal *Pseudachorutes*.

Antenna₄ with retractile apical papilla undivided; interior face with 4, outer face with 2 curved and thickened sense hairs; no sensory rasp (Fig. 26 d). Antennal organ III two minute, erect clubs, almost without integumental plica, guarded by two strong sense hairs; antenna₃ moreover with a sensilla in a groove (Fig. 28 c). Eyes 8+8. Postantennal organ with 7-8 elements arranged in a circular rosette (Fig. 28 a, b). Mouth cone short (Fig. 27 f). Mouth parts (seen in transparency): mandible with two teeth only (Fig. 27 c), maxilla needle-shaped with two lamellae (Fig. 27 d).

Unguis without inner or lateral teeth; no unguiculus, no differentiated tenent hairs.

Ventral tube with 4+4 setae; retinaculum bidentate. Furca present but reduced. Dentes rather short, almost triangular, with 4+4 setae; mucro present, reduced to no more than a hook-like continuation of the dens, not visibly separated from the latter (Fig. 27 e, g). Female genital orifice small, with 5 setae. No anal spines.

Chaetotaxy composed of short, smooth setae. It is almost impossible to homologize the setae, partly because only two specimens are available, but especially because the sensory setae are not visibly differentiated. Cephalic chaetotaxy with rows p and c incomplete; setae v and a₀ are lacking; d₁₋₅ (d₂ is unpaired, called d₀ in the papers of Da Gama et al.), sd₁₋₅. Th₁ with 3+3 setae. Th₂ with 4 setae in the a row and 3 setae in p row in discal area; th₃ identical except one seta missing in a row. In th₂₋₃, neither shows a distinct seta p₂ (Fig. 27 b). Subcoxae 1, 2, 3.

Discussion. The new species fits easily into the genus *Pratanurida*, created in 1973 by Rusek for his new *P. cassagnai* from Central Europe. That species was redescribed shortly afterward by Dunger, 1974. Briefly, *Pratanurida* is *Pseudachorutes* with the furca reduced. *Pseudachorutes mucronatus* is easily distinguished from *cassagnai* by its mucronate dens having 4+4 setae, the less coarse reticulation, the absence of seta a₀ on the head, the apparently real absence of setae p₂ in th₂₋₃, and perhaps also in the higher number of postantennal elements: 7-8 as against 4 (Rusek) or (4) 5-6 (Dunger) in *cassagnai*.

For a discussion concerning the position of *Pratanurida* and *Stachorutes Dallai*, 1973, intermediate between *Pseudachorutes* and *Micranurida*, I refer to Rusek (1973a) and Dunger (1974). I might only add that a tendency toward reduction of the dens is not altogether absent in *Pseudachorutes*, as indicated by *P. boernerii* Schött, 1902; this is why I consider *Stachorutes* a good genus, but *Pratanurida* a subgenus.

Neanura granulata Cassagnau & Delamare Deboutteville, 1955 (Fig. 28 d)

Material: sample 6: 1 ♀ and 1 ♂; 35: 1 ♀.

Description. Since the present material differs somewhat from the original description, which was based on 10 specimens from the Lebanon, I shall describe the Cretan specimens in some detail.

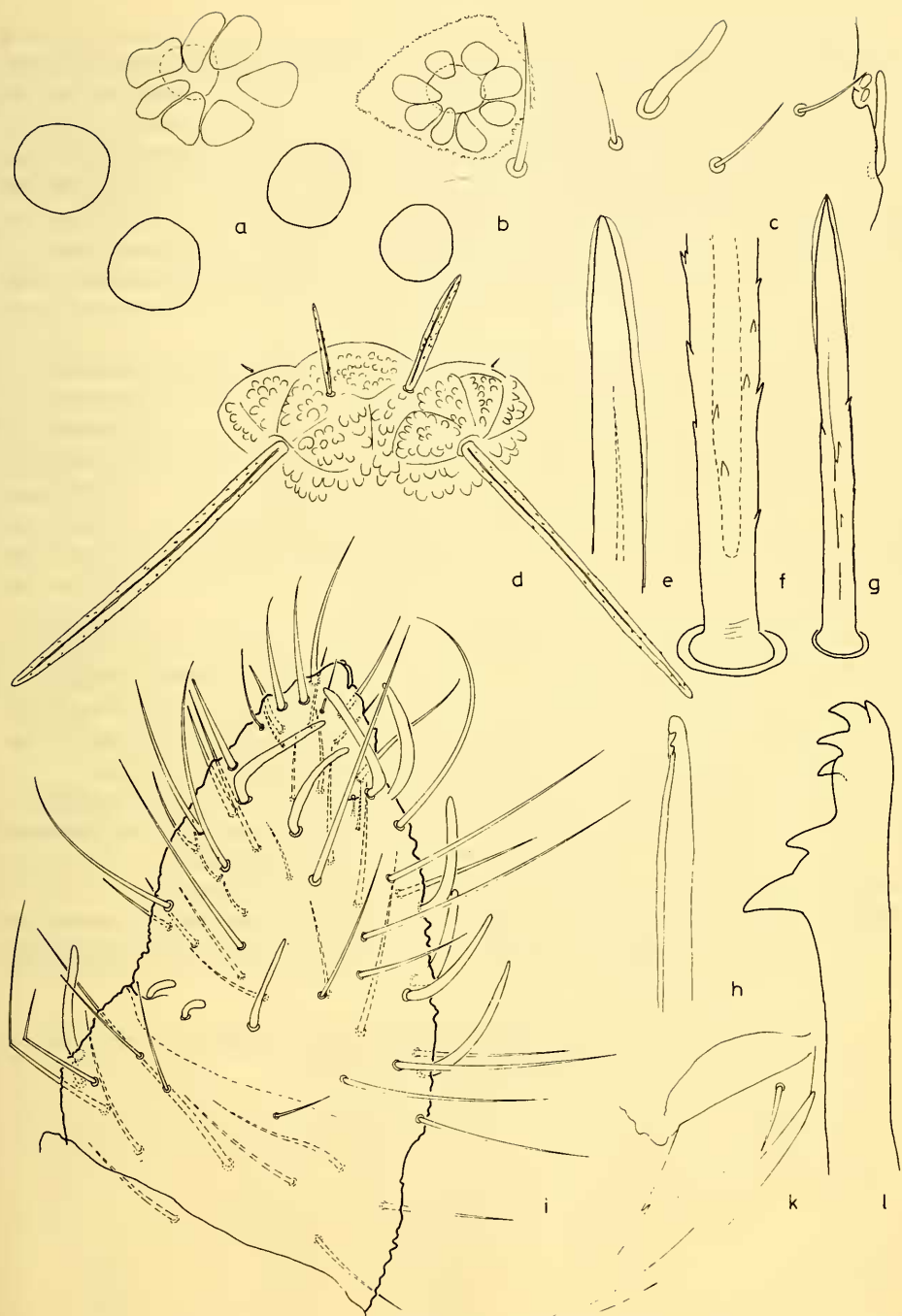


Fig. 28. *Pseudachorutes (Pratanurida) mucronata* n. sp. a, b, postantennal organs; c, antennal organ III. *Neanura granulata* Cassagnau & Delamare. d, chaetotaxy of tubercles di-di on abd. *Lathriopyga anthrenoidea* n. sp. e, f, apex and base of a long macrochaeta; g, small macrochaeta; h, maxilla; i, left antenna₃₋₄; k, unguis P₃; l, mandible

Length of male 1.1 mm; females 0.9 (sample 6) and 1.4 mm (sample 35). (This is at least 1 mm smaller than the original material, and some difference must possibly be explained by allometric growth). Colour in alcohol totally white, except the 2+2 lively blue eyes. Skin moderately granulate for the genus, more so on the tubercles, which are well differentiated by their coarser granulation and by their being elevated and provided with re-inforcement ridges. Antennae typical for the genus, apical bulb only indistinctly trilobate. Mouth parts also normal with needle-shaped maxilla and simple tridentate mandible. Claw toothless, no tenent hairs.

Ventral tube with 4+4 setae, rudiment of furca barely distinguishable, only three setae present at this location. Sixth abdominal segment completely visible from above.

Hairs of varying length, distinctly rugose with a pronounced double contour.

In the following Table 3 distinction is made between long (L) and short (S) macrochaetae, microchaetae (m), and setae sensuales (s). A macrochaeta is considered short if it is at most half as long as a seta in the same or a bordering tubercle. This denotation is only useful for the dorsal chaetotaxy; it loses its clarity for e.g. the lateral cephalic chaetotaxy. Fusion of tubercles is indicated by parentheses around the setal code. The anteromedian cephalic tubercle is not attached to the central one (LSS + LSS); central tubercle (LSS + S + LSS); ocular tubercle LLs; lateral tubercles of head LLLSmmm.

Note. In their drawing of abd, the authors of the species indicate that the fusion of the dorso-internal tubercles on that segment is rather incomplete, although they state in the text that the tubercles are fused along the median line. However, Massoud (1967), who studied the types, keys *granulata* with the species having these tubercles free, and this may raise some doubt about my identification.

The microchaetae on the dorso-internal tubercles of abd, are extremely small, sometimes even shorter than the diameter of a skin granule, and difficult to detect (Fig. 28 d). This not only differs from what the authors depicted, but may also confuse identifications when only the gross seta number is indicated.

Other points of divergence from original description are the full separation between central and anterior cephalic tubercle (perhaps not a very important

Table 3. Number of setae on dorso-internal (di), dorso-external (de), dorso-lateral (dl), and lateral (l) tubercles in *Neanura granulata*

	di	de	dl	l
head (posterior row)	LS	LS	LLSS	
thorax 1	S	SS	L	
2	LSS	LSs	LLSs	
3	LSS	LSsm	LSSs	
abdomen 1	LS	LSsm	LS	LSs
2	LS	LSsm	LS	LSs
3	LS	LSsm	LS	LSs
4	LS	LSs	LSS	LSs
5	(LSm + LSsm)	(LLSSss)		
6	(LLLLSSS)			

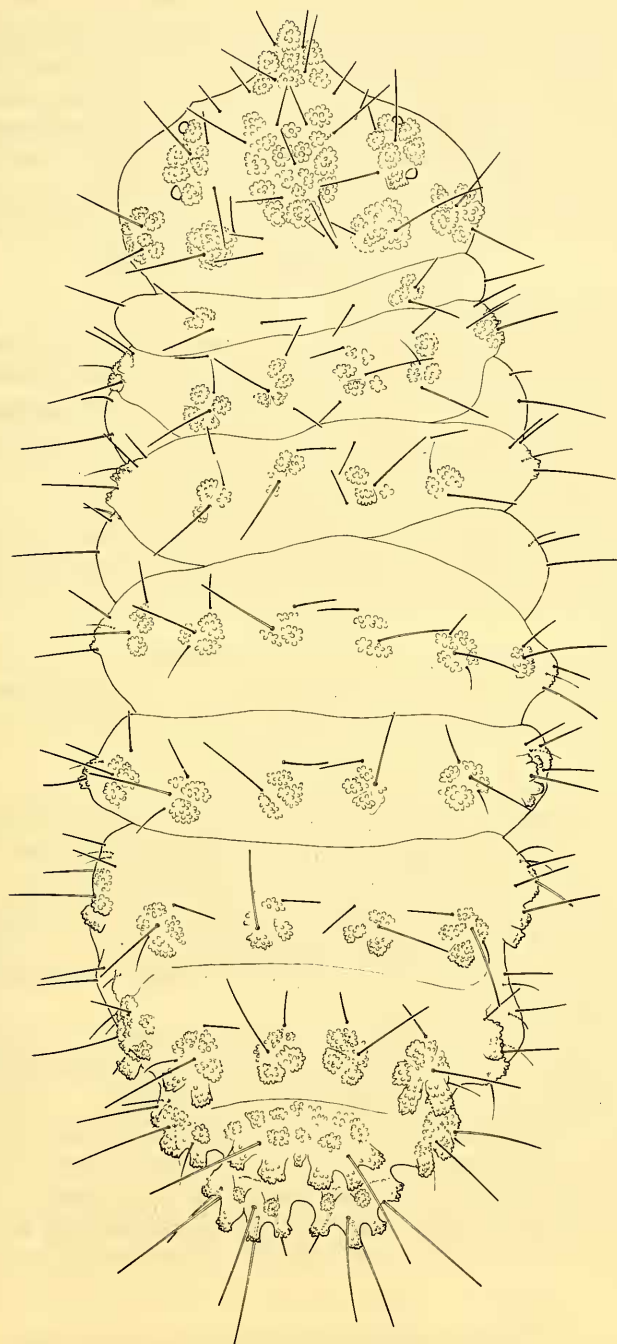


Fig. 29. *Neanura cretensis* n. sp., dorsal chaetotaxy

point, since the authors report having encountered difficulties in delimiting the tubercles) and the presence of an unpaired seta d_2 in the central tubercle.

If this description is compared with that of *N. tetrophthalma* (Stach, 1929) given by Dunger (1966), it is evident that the differences between the two species are feeble indeed. The most useful criterion seems to be the relative lengths of hairs, as Dunger has already remarked, especially with respect to the central cephalic tubercle (*tetrophthalma* has seta sd_2 long and stout in the central tubercle, the others are very thin and short; d_2 is unpaired — as in the present material!).

***Neanura cretensis* n. sp. (Fig. 29)**

Material: sample 27: 1 ♀, holotype.

Description. Length only 0.7 mm; nevertheless, the specimen seems fully adult, the genital orifice having about 16 setae on anterior lip. Blue pigment dispersed in irregular dots all over the body; eye patches intensely black. Integument between the tubercles moderately granulated, in the tubercles rather strongly granulated, posteriorly even more so. Especially the posterior tubercles are very strong. Ocelli 2 + 2. Sixth abdominal segment completely visible from above.

Antenna normal, apical papilla distinctly trilobed, sense hairs distinct. Mouth cone long, mouth parts not dissected, apparently normal for the genus. Unguis toothless, unguiculus absent. Ventral tube with 4 + 4 setae. Furca rudiment not recognizable.

Tubercles. Central and anterior cephalic tubercles free. Dorso-internal tubercle on head hind margin without rosette, as is the dorso-internal one in th. Dorso-internal tubercles on abd., fused, dorso-external ones fused with the lateral tubercles.

Chaetotaxy (Fig. 29). Macrochaetae without double contour, almost without serrations or granulations, not constricted at base. True microchaetae, which are distinct in *granulata*, are almost lacking. Again with the denotation: L: long macrochaeta, S: short macrochaeta (relative to macrochaetae in the same or bordering tubercles), m: microchaeta, s: sensory seta, the chaetotaxy is as indicated in Table 4. Head. central tubercles (LSS + S + LSS), anterior tubercle: (LSS + LSS), ocular tubercle: LLS, lateral: LLLmmm. Between central tubercle and antennal base a free seta S.

Discussion. This is again a species closely resembling *N. tetrophthalma* (Stach, 1929). This and some related species have been treated recently by Dunger (1966). *N. cretensis* differs from *N. tetrophthalma tatricola* (Stach, 1951) by having well-pigmented body and eyes; it differs from *N. t. lusatica* Dunger, 1966, by having the macrochaetae neither granulate nor basally constricted, and also in the different length proportions of the macrochaetae (most distinct in central cephalic tubercle and abd.). *N. cretensis* differs from typical *tetrophthalma* by having the unguis toothless, and from all mentioned taxa by having the tubercles much more developed.

***Lathriopyga anthrenoidea* n. sp. (Fig. 28 e-l and 31)**

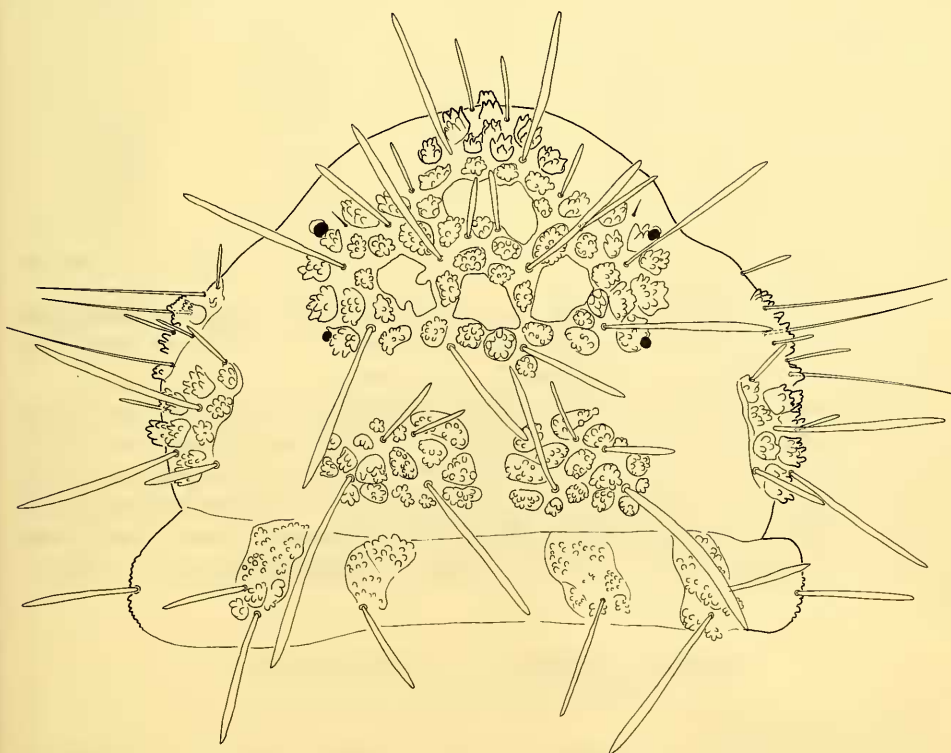
Material: sample 25: 1 juvenile, holotype, and 3 more juveniles; 43: 1 juv.

Description. Length of the largest specimen, the holotype, is 1.4 mm; others

Table 4. Number of setae on dorso-internal (di), dorso-external (de), dorso-lateral (dl), and lateral (l) tubercles in *Neanura cretensis* n. sp.

	di	de	dl	l
head (posterior row)	LS	LS	LL	
thorax 1	S	LSs	L	
2	LSS	LSs	LSSsm	
3	LSS	LSs	LSSs	
abdomen 1	LS	LSs	LS	LSs
2	LS	LSs	LS	LLs
3	LS	LSs	LS	SSss
4	LS	LSs	LLS	SSSSss
5	(L + L)		LLSS	
			LLSSss	
6		LLLSS		

range from 1.1.-1.3 mm (a mean is of course not meaningful in immature material). Habitus normal for the genus, due to the very long macrochaetae not unlike that of a carpet beetle larva, *Anthrenus*. Abd₆ completely hidden. Pigmentation wholly absent except for the 2 + 2 strongly dark-blue pigmented eyes. Skin granulation basally not very strong, well spaced. Tuberculation in the rosettes not very strong though distinct.

Fig. 30. *Lathriopyga longiseta* (Caroli), dorsal chaetotaxy of head and th₁

Ant₄ with trilobed, not very distinct apical papilla and 8 sense hairs. Antennal organ III two sensillae, strongly bent in the same direction, guarded by a strong ventral and a weaker dorsal sense hair (Fig. 28 i). (Skin granulation of antenna rather uneven. Dorsal part of ant₁, and whole basal part of ant₄ rather coarsely granulate, other parts, especially dorsal part of ant₃ weakly granulate).

Eyes 2 + 2. Mouth cone long; mouth parts not dissected; in transparency a 6-toothed mandible is visible, with basal tooth strongly developed (Fig. 28 l), and a needle-shaped maxilla with two lamellae which are closely appressed (fused or not) and provided with some apical denticulation (Fig. 28 h).

Feet plump, with a distinct tooth on inner lamella; lateral lamellae toothless (Fig. 28 k). Subcoxae with 1, 3, 3 setae. Ventral tube with 4 + 4 setae. Furca rudiment a median boss with some 8 setae.

Vestiture consisting of very heavy, blunt, distinctly rugose, apically winged macrochaetae of variable length, often conspicuously long, a few minute microchaetae, some sensory setae, and ventrally shorter, undifferentiated setae. The dorsal chaetotaxy is summarized in Table 5 (cf. also Fig. 31).

Table 5. Number of setae on dorso-internal (di), dorso-external (de), dorso-lateral (dl), and lateral (l) tubercles in *Lathriopyga anthrenoidea* n. sp.

	di	de	dl	l
head (posterior row)	LS	L	LLSSS	
thorax 1	L	LS	L	
2	LSS	LSs	LSSs	
3	LSS	LSSs	LSSs	
abdomen 1	LS	LSSs	LS	LSs
2	LS	LSSs	LS	LSs
3	LS	LSSs	LS	LSs
4	LS	LSs	LSSs	SSSs
5	LS		LLSSS	

On the head all tubercles are free and well developed. The apical tubercle has setae (LS + SL), the central tubercle has (LSS + SSL) and lacks an unpaired seta, ocular tubercle has LLm, lateral tubercle LLLSSmm.

Discussion. The complete absence of fusion of tubercles makes this species very distinctive. This is why I venture to describe the new taxon on the basis of the present meagre material. Also, the distinct tooth on the unguis (which is, however, much less strongly developed than in *longiseta* (Caroli, 1912) and *hellenica* Ellis, 1974) is a rather divergent character. The thoracic chaetotaxy points to an affinity with the *L. phlegraea* group, but there the dorso-internal tubercles are fused in abd₅.

Lathriopyga longiseta (Caroli, 1912) (Fig. 30)

Material: sample 35: 1♂.

The single specimen, measuring 1.1 mm, agrees well with the original description and the more detailed description given by Da Gama (1964). The

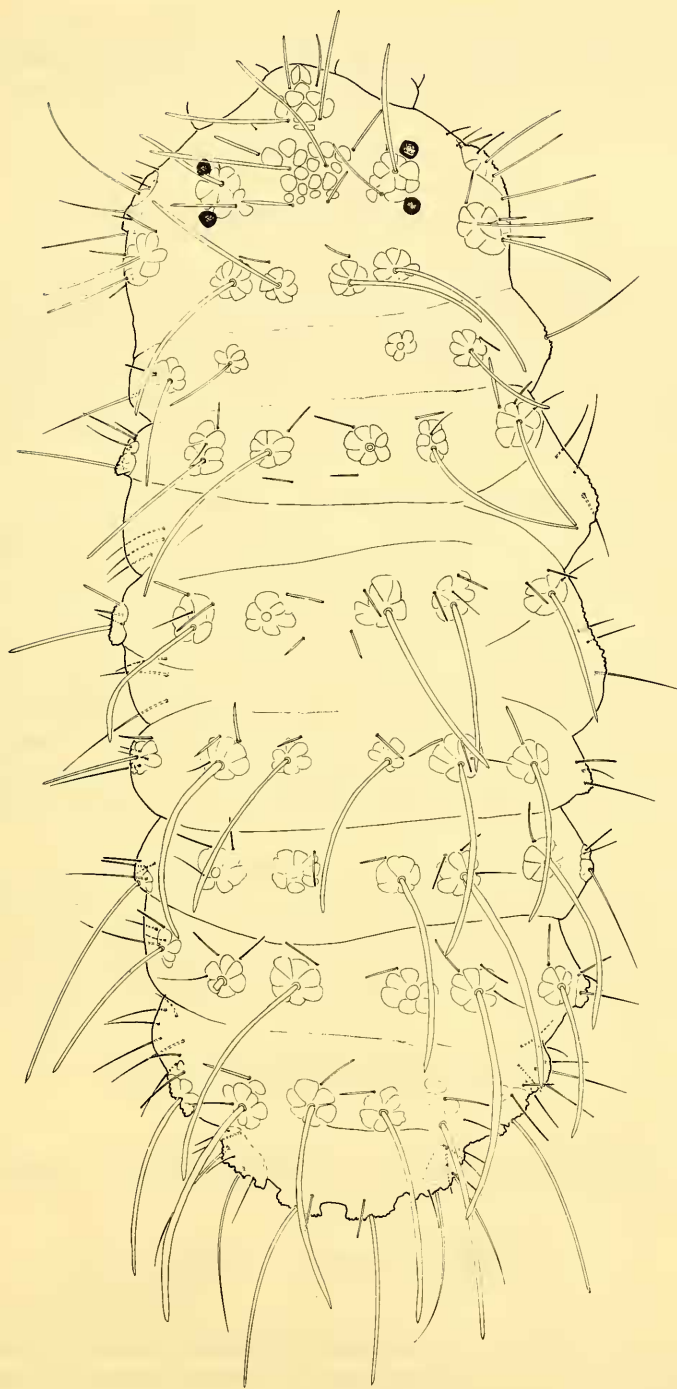


Fig. 31. *Lathriopyga anthrenoidea* n. sp., dorsal chaetotaxy

species has been recorded from Italy, Corsica, Madeira, Yugoslavia, and — since the synonymy with *L. hystrix* (Bagnall, 1940) was established by Lawrence in 1970 — England. The near relative *L. hellenica* Ellis, 1974, was described from Rhodes.

ISOTOMIDAE

Coloburella linnaniemii (Denis, 1937)

Material: sample 21: 2 juv.

Their immaturity taken into consideration, the two specimens are in good agreement with the redescription of *C. linnaniemii* given by Rusek (1972). The only notable deviation is the somewhat longer furca — the tip of the mucro reaches onto abd₂ over about ½ segment length. The species is now known from Italy and Crete; the near relative *C. cassagnau* Rusek, 1972, occurs in the Pyrenees.

Tetracanthella cf. *hygropetrica* Cassagnau, 1954 (Fig. 32a)

Material: sample 19: 9 immature specimens, only some of recognizable sex (2 ♀, 2 ♂).

Discussion. A gradual intergradation seems to exist from *T. tuberculata* Cassagnau, 1954 (described from the Sierra de Guadarrama, since then recorded from Portugal, the Pyrenees, Corsica, Italy, Yugoslavia, and the USSR), through *T. hygropetrica luxemburgensis* Stomp, 1968 (Luxemburg) and *T. h. matthesii* Da Gama, 1959 (Madeira), to *T. h. hygropetrica* (described from the Pyrenees, recorded from Portugal and Spain as well as from Italy). In fact, the best argument in favour of the validity of *luxemburgensis* and *matthesii* is their isolated occurrence.

The present material is, due to its immaturity, difficult to identify. It has a manubrium/dens ratio of about 6/5 (Fig. 32a), which comes closest to the Portuguese *hygropetrica hygropetrica* described by Da Gama (1964). In the present material reticulation is mixed and fine, mostly as narrow as the diameter of the hair rings, locally narrower. A smooth area occurs only in postero-median part of abd₄.

Isotomodes trisetosus Denis, 1923

Material: sample 13: 1 ♀.

In her monograph of the genus, Da Gama (1963) gives records from South-Central Europe, Madeira, the Azores, and Peru.

Folsomides parvulus Stach, 1922 (Fig. 32b, c)

Material: sample 16: 3 ♀ and 2 juv.; 29: 4 juv.; 30: 5 ♀ and 14 juv.; 35: 1 ♀ and 5 juv.; 36: 2 ♀; 37: 1 ♀; 38: 1 ♀; 43: 13 ♀ and 13 juv.; 44: 6 ♀ and 6 juv.; 45: 1 ♀.

Discussion. My description and notes on variability in material from Rhodes (Ellis, 1974) are also applicable to the present material. The eye number is invariably 2 + 2; the eyes are sometimes devoid of pigment, especially in juveniles

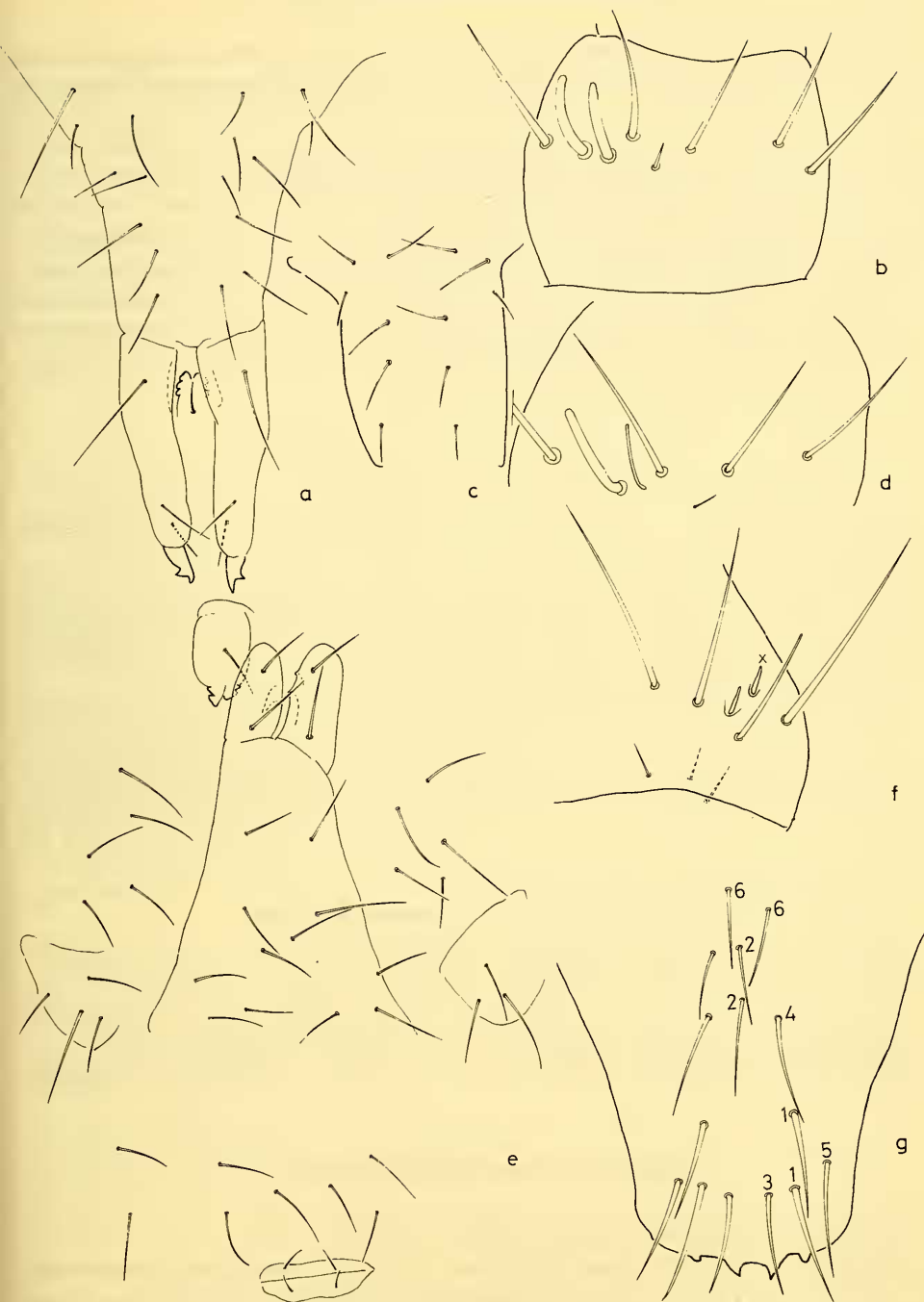


Fig. 32. *Tetracanthella* cf. *hygropetrica* Cassagnau, 1954. a, posterior face of furca and retinaculum. *Folsomides parvulus* Stach. b, ventral face of ant₁; c, manubrium of holotype. *Folsomides nanus* Ellis. d, ventral face of ant₁; e, ventral aspect of abd₁₋₅. *Folsomia ksenemani* Stach. f, ventral face of ant₁ (sensilla indicated by x is absent in smaller immatures); g, chaetotaxy of anterior face of manubrium, with indication of the order of appearance of the setae in the ontogeny

and small adults. Posterior face of dens with 3 + 3 setae, except in three specimens (two juveniles from sample 16, and a ♀ from sample 30) in which I found only 2 + 3.

Dr. A. Szeptycki kindly loaned me the holotype of the species under consideration. It is mounted on a slide bearing two labels, both with a blue margin and handwriting: a small one stating "Unicum", and a larger one "*Folsomides parvulus* n.g.-n.sp. Berekalja 1915". The specimen is an adult ♀ and measures 590 μ. The condition is rather poor, but I could study the furca in some detail. The dens has at one side distinctly 3 setae; in the other dens the two distal setae are visible, but due to a dirt particle observation of the basal seta is impossible. The posterior face of the manubrium bears 6 + 6 setae (Fig. 32c).

Again, the species seems to be parthenogenetic.

***Folsomides americanus* Denis, 1931**

Material: sample 13: 1 ♀ and 1 juv.; 26: 4 ♀ and 1 juv.; 27: 3 ♀ and 6 juv.; 43: 4 juv.

Discussion. The difference between *americanus* and *parvulus* is based on one character only. The posterior pair of ocelli is lost in *americanus*. Not only pigment granules but also a lens are missing, and the primary granulation on the location of the second pseudocellus in *parvulus* is completely regular.

After some hesitation (due in part to the apparent coexistence of *americanus* and *parvulus* in sample 43), I prefer to separate *americanus* as a distinct species. One of the arguments for doing so is that *parvulus* shows no trend indicating obliteration of the posterior ocellus: posterior and anterior ocellus always show an almost equally dense pigmentation and are equally large; moreover, there are no asymmetries.

The ocelli of many immatures of *americanus* are not or only weakly pigmented, as in *parvulus* and "*anophthalmis*" Hepburn & Woodring, 1964.

Although the limited number of specimens does not permit of definite statements, here too there is an indication of parthenogenesis.

The species seems to occur in all subtropical regions in the Americas and Europe. It has already been recorded from the Lebanon (Cassagnau & Delamare Deboutteville, 1955), Spain (Selga, 1973), and France (Cassagnau & Rouquet, 1962).

***Folsomides navacerradensis* Selga, 1962**

Material: sample 36: 4 ♀, 5 ♂, and 11 juv.

Discussion. The specimens agreed well with the description by Selga, apart from the variability in dental chaetotaxy, as described by Petersen (1965). The number of setae on the posterior face of the manubrium fluctuated (in adult specimens) between 7 + 7 and 12 + 12; on dentes both 3 and 4 setae occurred. The Cretan material thus cannot be related to *F. navacerradensis pratensis* Palissa & Živadino-
vić, 1974, from Bosnia. Here, only 3 setae are constantly present on the dens, and

the manubrium has at most 8 pairs of setae. In two specimens (a juvenile and a ♂) one of the dentes lacked the mucro. This is the distinctive feature of *F. meridionalis* Dallai, 1973, described from the Eolic Islands.

***Folsomides marchicus* (Frenzel, 1941)**

Material: sample 24: 2 ♀.

The specimens did not deviate from the original description. Pigment was fairly well developed; posterior face of dens with 3+3 setae in both specimens.

The species has been recorded before from Spain and Ibiza, France, Italy, Germany, Switzerland, the ČSSR, and Yugoslavia.

***Folsomides nanus* Ellis, 1974 (Fig. 32 d, e)**

Material: sample 12: 2 ♀ and 1 juv.; 25: 1 ♀; 30: 2 ♀; 36: 18 ♀ and 2 ♂; 43: 2 ♀, 3 ♂, and 3 juv.; 45: 16 ♀, 6 ♂, and 4 juv.

Discussion. Mean length of the females 0.70 mm ($s = 0.08$, $s_{\bar{x}} = 0.01$, $n = 41$), that of the males 0.55 mm ($s = 0.04$, $s_{\bar{x}} = 0.01$, $n = 11$). The specimens are in good agreement with the material of *nanus* from Rhodes, with one exception. The dens shows no trace of a mucro and is very blunt in the ventral view. In the material from Rhodes, the dens is always more or less contracted apically to a vestige of a mucro in the ventral view. Moreover, in the present material the manubrium has at its posterior face a slightly higher number of setae, the modal value being 6+6, often asymmetrically 5+6 or 6+7 (Fig. 32 e).

Since the Cretan material was collected in the autumn, seasonal variation may partially explain the difference, and I therefore refrain provisionally from giving the Cretan material subspecific status.

***Folsomia ksenemani* Stach, 1947 (Fig. 32 f, g)**

Material: sample 12: 2 juv.; 13: 33 juv. (2 immature ♀); 14: 3 juv.; 19: 10 juv. (1 immature ♀); 21: 1 juv.; 25: 39 juv.

Discussion. The number of ocelli is constantly 1+1, and I have no reason to agree with Christiansen (1959) and other authors that *ksenemani* represents aberrant one-eyed specimens of a two-eyed species such as *penicula* Bagnall, 1939.

In the antennal organ I, two small sensillae (but in the smaller immatures constituting the majority of the present material only one) are guarded by a sense hair which is barely differentiated from a normal hair (Fig. 32 f). Moreover, a small basal spine is present here; the dorsal homologues being two comparable spiniform setae. Thoracal sternites without setae. Ventral tube anteriorly bare, posteriorly usually with 4 setae, in lateral flaps usually with 3+3, sometimes with 3+4 and in one example even with 4+4 setae. All this applies to immature material.

The number of setae on anterior face of manubrium varied strongly. Table 6 gives the frequencies I could observe. Although the present material includes no mature specimens, the higher setal numbers already outvalue the limit given by

Table 6. Number of anterior setae of the manubrium of *Folsomia ksenemani*

Sample nr.	Number of setae											
	4	5	6	7	8	9	10	11	12	13	14	15
12	-	-	-	-	-	-	1	1	-	-	-	-
13	-	-	3	2	3	5	7	4	7	-	1	1
14	-	-	-	-	1	-	1	1	-	-	-	-
19	1	-	2	1	1	1	2	-	2	-	-	-
21	-	-	-	1	-	-	-	-	-	-	-	-
25	-	-	-	-	2	4	3	4	21	2	3	-
Total	1	-	5	4	7	10	14	10	30	2	4	1

Stach (1947) for *ksenemani*, and consequently the material should be identified as *F. pseudodiplophthalma* Stach, 1947. These two species have, however, been synonymized on rather convincing grounds by Poinot (1972). Acting furthermore as "first revisor", she has invalidated *pseudodiplophthalma*, and I follow her in the synonymy. The low values are, however, no less instructive, because they suggest an impending synonymy of *ksenemani* with (the senior name!) *monophthalma* Bagnall, 1939, described from Romania, and, according to Lawrence (1973) an immature! Topotypical material might show that this suspicion is justified.

The gradual rise in setal number on the manubrium follows a rather regular pattern. In Fig. 32 g I have numbered the setae according to the order in which they appear. Only level 4 and 5 are interchangeable, and I often found a specimen with both arrangements asymmetrically.

***Cryptopygus thermophilus* (Axelson, 1900)**

Isotomina salaymehi Christiansen, 1959. — **nov. syn.**

Material: sample 4: 3 ♀, 3 ♂, and 6 juv. + 10 ex. in alcohol; 7: 2 ♀, 6 ♂, and 3 juv.; 18: 1 ♀ and 5 juv.; 20: 1 ♀, 1 ♂, and 10 juv.; 32: 1 juv.; 41: 2 ♀ and 2 juv. + ca. 90 ex. in alcohol; 48: 3 ♀, 1 ♂, and 2 juv. + 100 ex. in alcohol.

Discussion. The unguis is toothed in almost all specimens. Tenent hairs not clavate. Proportional width of postantennal organ rather variable. Ventral tube with 4+4 setae on lateral flaps, and 1+1 posterior setae. Thoracic sternites without setae.

The species described by Christiansen, recorded from several localities in the Lebanon, would differ from *thermophilus* by a pair of blunt sensory setae on abd₆, a faint subdivision in the distal part of the tibiotarsus, a small ocellus D, and by having the longest setae on the abdomen three times longer than shortest ones. All these characters can be found in material referable to *thermophilus*, not only in the present material, but also in specimens from western Europe. The sensory hair of abd₆ is typical for the whole species group.

The species seems to be cosmopolitan.

***Cryptopygus ponticus* (Stach, 1947)**

Material: sample 9: 1 juv.; 10: 1 ♀ and 6 juv. + 68 ex. in alcohol; 11: 1 ♀, 5 ♂, and 2 juv. + 23 ex. in alcohol; 16: 1 ♂; 17: 3 juv.; 23: 4 juv.; 29: 1 ♀, 1 ♂, and 2 juv.;

30: 1 ♀ and 2 juv.; 34: 1 ♀ and 1 juv.; 36: 1 ♀ and 2 ♂; 37: 2 ♀; 38: 1 ♀; 41: 1 ♀, 1 ♂, and 1 juv.; 42: 1 ♂ and 5 juv.; 43: 2 ♂ and 8 juv.

Discussion. Tooth on internal unguual lamella distinct. Lateral flaps of ventral tube constantly with 4+4 setae. Posterior face of ventral tube in adult specimens always with more than 1+1 setae: modal value 2+2, less frequent values 1+2 or 2+3. (This is a useful additional difference from *C. thermophilus*, but may not be valid everywhere, since Yosii (1966b) described *ponticus* from Afghanistan with 1+1 posterior setae). Juveniles often have only 1+1 posterior setae; in adults the longest, distal setae seem to be the homologues of the pair present in *C. thermophilus*.

***Cryptopygus triglenus* n. sp. (Fig. 33)**

Material: sample 23: 2 juv.; 26: 5 ♀, 5 ♂, and 3 juv.; 27: 5 ♀ and 5 juv.; Holotype is a ♂ from sample 26.

Description. Mean length of the 5 males 0.76 mm ($s = 0.03$, $s_x 0.01$), that of the 10 adult females 0.92 mm ($s = 0.08$, $s_x 0.03$).

Pigment sparsely distributed in grey clouds over head and body; eye patches are well pigmented. Integument finely and regularly granulate. Hair cover consists of moderately fine smooth setae.

Ant: Head = 1.08. Ant. 1:2:3:4 = 36:54:57:100. Ant₄ without apical retractile bulb, only a semiglobular protuberance; subapically, a small sensilla in a deep groove, guarded by a short strongly bent seta; the segment is covered by normal hairs and by many sense hairs. Ant₃ with ant. org. III composed of two flexed sensillae guarded by two sense hairs; external sensilla in the middle of this segment spine-like (Fig. 33 d). Antennal organ I with two long sense hairs, the external one the shortest, and a small spine-like setula near base of segment (Fig. 33 e).

Eyes 3+3. Two ocelli set close together in one intense pigment spot, a third one lies about 1.5 eye-diameters more caudad, on its own pigment bed. Postantennal organ oval, with a thickened anterior "rim" and a weak transverse subdivision (Fig. 33 b). Labral chaetotaxy 4/5, 5, 4. Mandible normal, maxillar head with rather narrow lamellae which do not reach beyond the claw.

Thoracal sternites without setae. Unguis with a distinct inner tooth, without lateral or dorsal teeth; unguiculus with weak inner lamella, without apical filament (Fig. 33 f). No clavate tenent hairs. Apical part of tibiotarsus weakly separated from main part by indistinct furrow.

Abdominal sternites in mid-line bare. Ventral tube without anterior setae, posteriorly with about 2+2 setae (the distal pair the strongest), in lateral flaps with 4+4 setae. Retinaculum quadridentate with 1 seta on corpus. Male and female genital orifices normal. Abd₅ and abd₆ completely fused. On abd₆ ventrolaterally, an indistinct sense hair.

Manubrium anteriorly with 1+1 strong subapical setae, posteriorly with about 20+20 setae in a very symmetrical arrangement (Fig. 33 a). Two pairs of manubrial spines. Dentes finely corrugated, anteriorly with 15 strong setae, posteriorly with 1, 1, 1, 2, 2 fine setae (Fig. 33 c). Mucro bidentate, not lamellate.

Discussion. As far as I know, the genus includes only two species with 3+3 eyes:

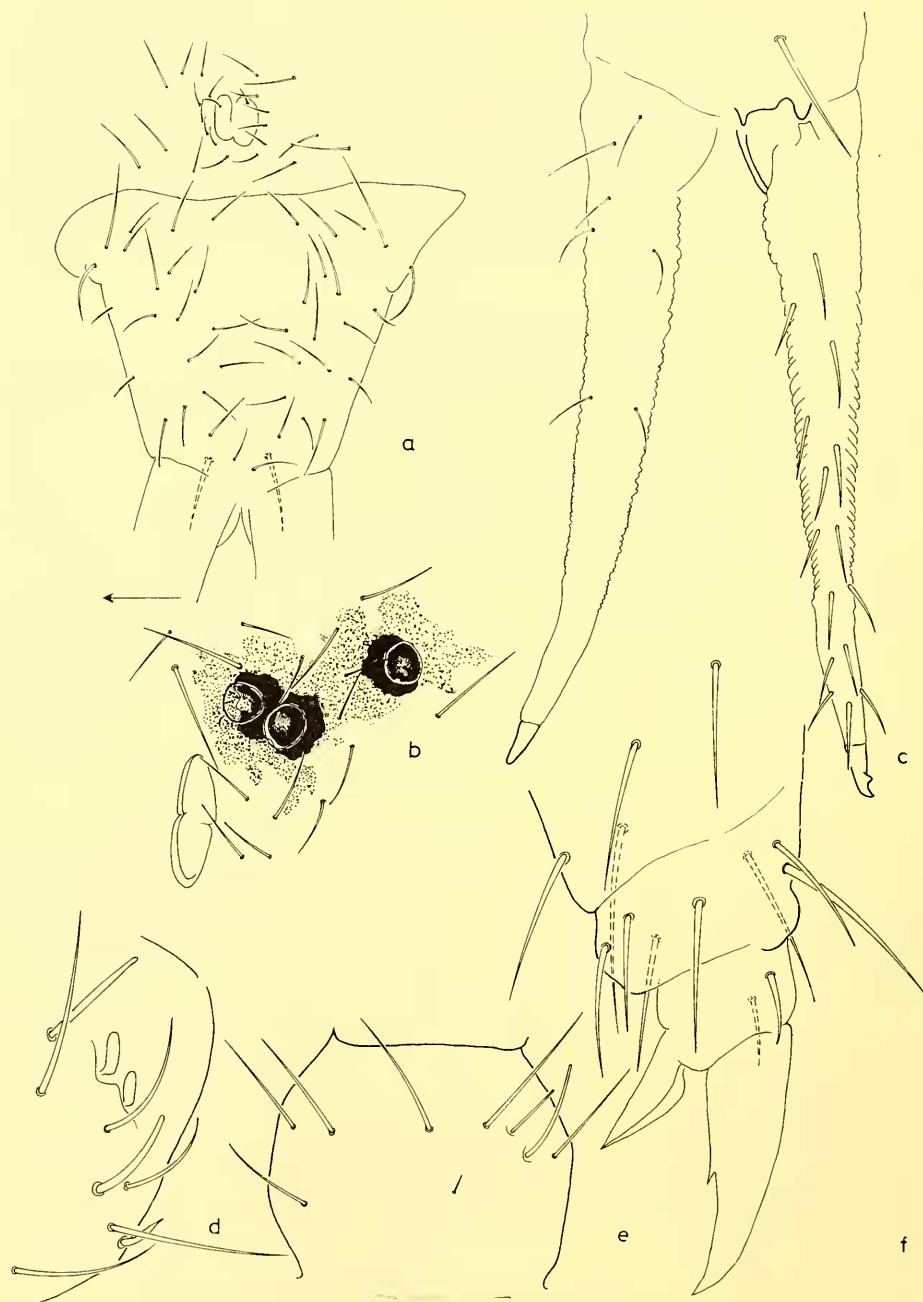


Fig. 33. *Cryptopygus triglenus* n. sp. a, posterior chaetotaxy of manubrium; b, eye-patch and postantennal organ; c, posterior and anterior aspects of mucrodens; d, antennal organ III; e, ventral aspect of ant₁; f, claw of P₃

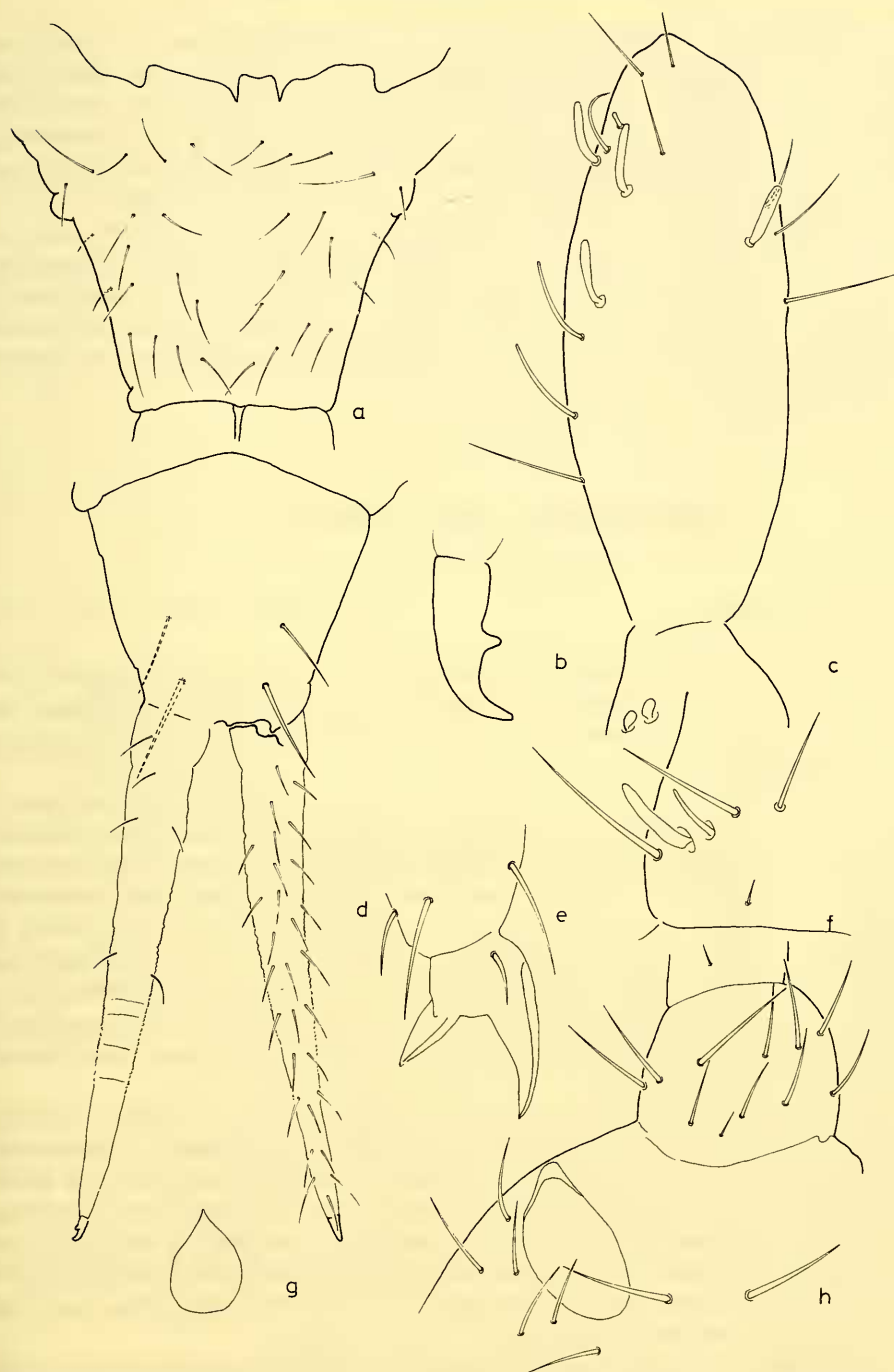


Fig. 34. *Cryptopygus debilis* (Cassagnau). a, posterior aspect of manubrium; b, mucro; c, location of sensillae and some setae on ant₄; d, anterior aspect of manubrium, posterior (left) and anterior face (right) of mucrodens; e, claw of P₃; f, antennal organ I; g, receptaculum seminis; h, dorsal aspect of postantennal organ and ant₁.

C. trioculatus Izarra, 1972, from Argentina, and *insignis* Massoud & Rapoport, 1968, from Patagonia. The former belongs to the series with the dens much reduced (anteriorly only one, posteriorly two setae) and is undisputedly very different from *triglenus*. *C. insignis*, however, comes close to *triglenus*, but differs in the tridentate mucro and the somewhat shorter dens with a different chaetotaxy, especially posteriorly, and, finally, in the enormous postantennal organ.

C. triglenus obviously is a near relative of *C. ponticus*, and differs from that species only in its eye number. It is not without some hesitation that I propose this new species on the basis of a single difference. That for the time being I nevertheless consider *triglenus* a good species is explained by the fact that no intermediate eye numbers (3+4, 4+4 or 4+5) have been detected in the rich material available.

The specific name means "with three jewels".

Cryptopygus debilis (Cassagnau, 1959) (Fig. 34, 35 a, b)

Material: sample 13: 1 ♀ and 12 juv.; 14: 2 juv.; 25: 6 juv.; 35: 6 ♀; 36: 1 juv.; 44: 16 juv.; 45: 1 ♀ and 1 juv.

Description. *Isotomina debilis* was described from the Central Pyrenees, from two alpine localities. This makes my identification less likely. It is unfortunate that the original description is very short, and I add, therefore, a complete description of my material here.

Mean length of the 7 adult females 0.53 mm ($s = 0.02$, $s_x = 0.01$). No trace of pigment. Integument basically normal, with a fine primary granulation. However, abd₄ and abd₅₋₆ show numerous, irregularly distributed circular structures which I cannot interpret (Fig. 35a). They are about as large as hair bases, sometimes smaller, and consist of a raised ring with a depressed centre — resembling an erythrocyte. They occur in juveniles and adults, and are not correlated with moulting. I would consider this phenomenon to be an artefact if it was not always limited to the same segments and did not occur in material from all localities. I have never seen a comparable structure, save perhaps in entomobryoid pseudopores. Hairs normal, smooth.

Antennae: head = 1.2; ant. 1:2:3:4 = 30:50:55:100. Ant₄ without exsertile papilla, subapical sensilla remarkably large, guarded by an equally proportionally strong, bent hair. Some sense hairs, difficult to identify, occur on this antennomere, as well as 3 outer and 1 inner swollen, curved sense hairs (Fig. 34c). Ant₃ with antennal organ III composed of two short sensillae, guarded by two apparently normal hairs. External sensilla of this antennomere in the shape of a curved spine. Antennal organ I consists of a thick outer and a thin (and a bit shorter) inner sense hair (Fig. 34f).

Eyes absent. Postantennal organ usually very large, almost without a rim (only some thickening in ventral corner). Some specimens (juveniles) have, however, a somewhat less disproportionate PAO. Mouth parts normal. Labral chaetotaxy is 3/5, 5, 4.

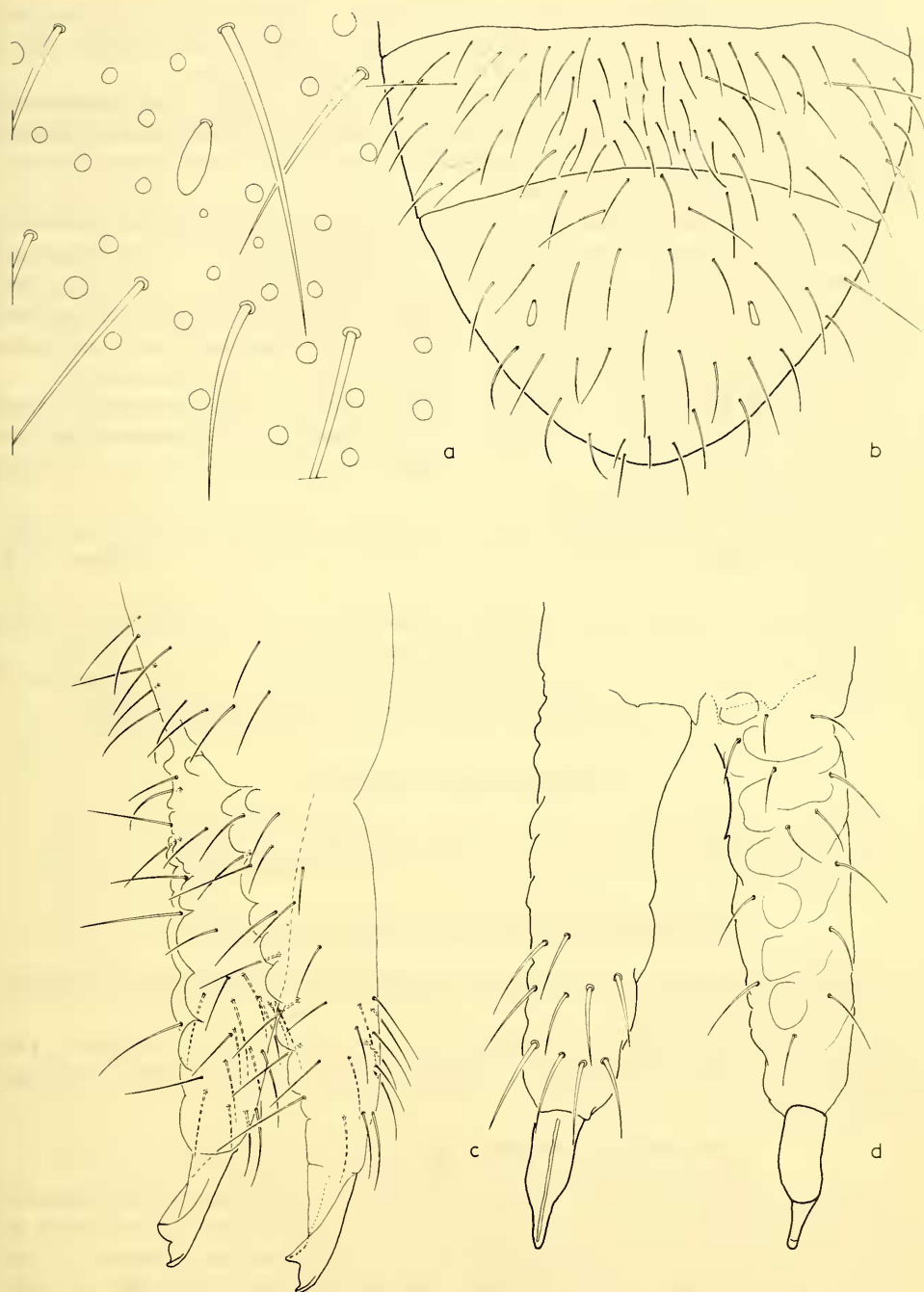


Fig. 35. *Cryptopygus debilis* (Cassagnau). a, sensilla, some setae, and cuticular ornamentation of abd_4 ; b, chaetotaxy of abd_{4-6} . *Clavisotoma albertinae* n. sp. c, lateral aspect of furca; d, anterior (left) and posterior (right) aspect of mucrodens

Thoracal sternites bare except 1 + 1 seta on th_3 . Claws simple, unguis without teeth, unguiculus with proportionally strongly developed outer lamella, tenent hairs not clavate; subsegmentation of tibiotarsi not seen (Fig. 34e).

Ventral tube anteriorly without setae, 4 + 4 setae on lateral flaps, posteriorly usually with 1 + 2 setae (if more adult material had been available this might have been a higher figure). Retinaculum quadridentate, with one seta on corpus. Abdominal sternites bare in median line.

Manubrium posteriorly with about 16 + 16 or 17 + 17 setae (Fig. 34a), anteriorly in all except two adult specimens with 2 + 2 setae, arranged in a distal pair and another pair in about the middle of the manubrium (Fig. 34d). The same arrangement was found in only one juvenile. The remaining juveniles and one adult had only the distal pair of setae. The last adult specimen, which was at the point of ecdysis, had 1 + 1 setae on the old skin, and 2 + 2 on the new one.

Manubrium distally with a pair of weak though distinct manubrial spines (Fig. 34a). Dentes posteriorly with about 25 corrugations, basal and apical part not corrugated (Fig. 34d). Anteriorly there are about 30 setae, posteriorly 1, 1, 2, 2 fine setae. Mucro bidentate (Fig. 34b).

Abdomen 5 and 6 completely fused. Abd_5 with 1 + 1 short clavate sensillae. They are usually relatively very thick, but in some cases are slightly more slender (Fig. 35a, b).

Since part of the juvenile material consisted of immature males, there is no question of regarding the species as parthenogenetic.

Since Mr. P. N. Lawrence is preparing a revision of the genus *Cryptopygus*, I leave it to him to compare this species with the other members of the genus.

***Proisotoma minuta* (Tullberg, 1871)**

Material: sample 4: 1 ♀; 6: 1 ♀; 23: 1 ♀, 1 ♂, and 2 juv.

The species seems to have an almost cosmopolitan distribution.

***Ballistura schoetti* (Von Dalla Torre, 1895) (Fig. 37f)**

Material: sample 40: 1 ♀ and 16 juv.; and also some 120 specimens, apparently all immatures, in alcohol.

The only adult specimen measured 1.0 mm, and was still very pale. This halophilous species is distributed along the coasts of the Atlantic and the Mediterranean.

***Clavisotoma albertinae* n. sp. (Fig. 35c, d, 36, 37a-e)**

Material: sample 26: 4 juv.; 32: 15 ♀, 13 ♂, 3 juv., and 1 specimen of unknown sex; 36: ca. 550 ex. in alcohol; 37: 1 juv.; 38: 10 ♀, 11 ♂, 11 juv., and ca. 50 ex. in alcohol; 39: ca. 300 ex. in alcohol, not sorted according to sex; from 43: 1 ♀; 50: 1 ♀. All material (except the specimens in alcohol) mounted individually on slides in Marc André II; some specimens depigmented. Holotype is a ♂ from sample 32, all other specimens being paratypes except a very immature specimen from 32, which cannot be attributed to the species with sufficient certainty.

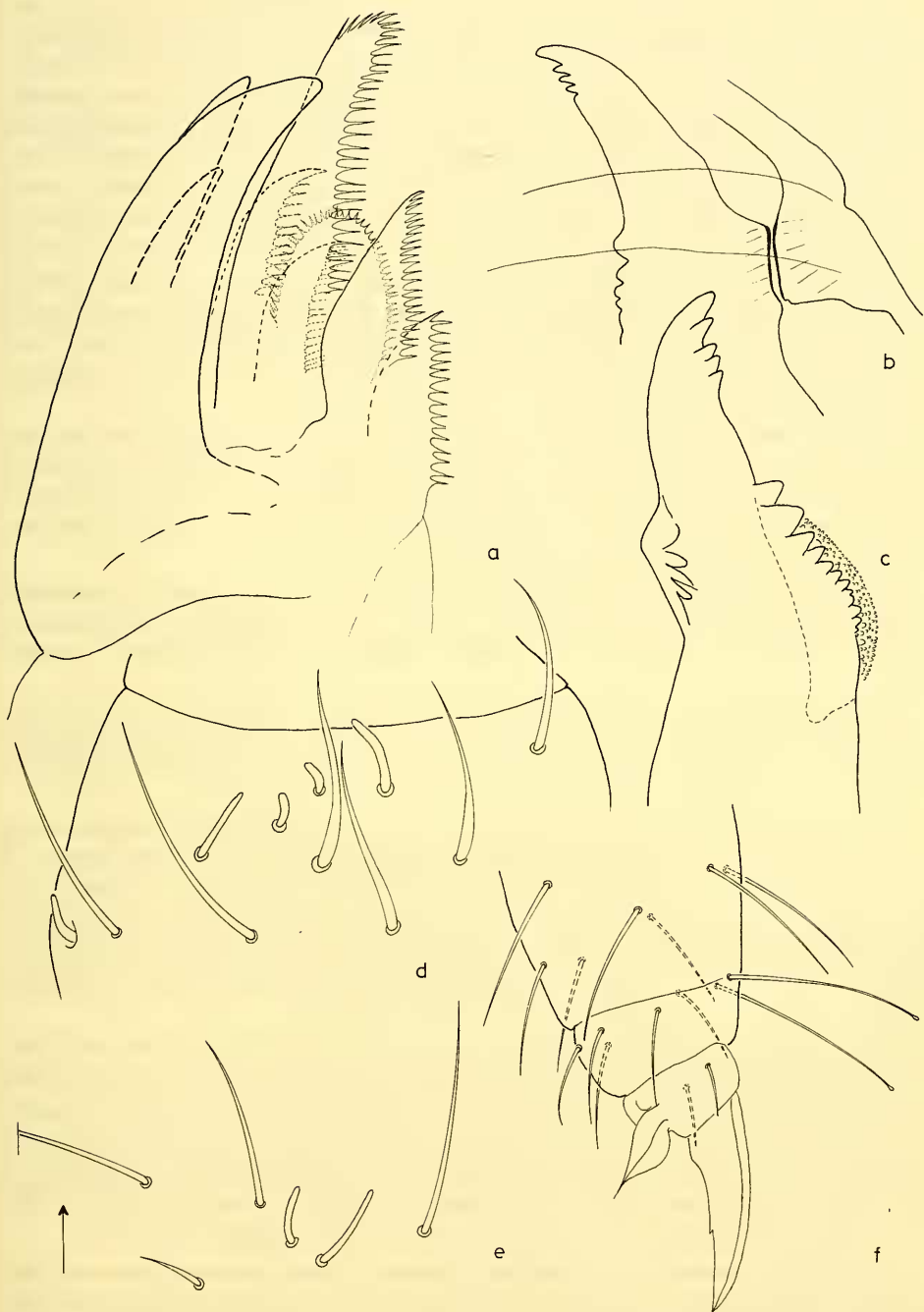


Fig. 36. *Clavisotoma albertinae* n. sp. a, maxillar head; b, articulation of mandible against the clypeus; c, mandible; d, antennal organ III; e, antennal organ I; f, claw of P_2

Description. Total length 1.1 mm, the sexes not differing markedly in size. Habitus stout, characteristic for the genus. Pigmentation moderate, bluish-grey. The whole body and all the extremities are pigmented; head and dorsum distinctly darker than other parts. Integument smooth, hairs short and stout, curved. Antenna: head = 0.85. Ant. 1:2:3:4 = 45:48:60:100. Ant₄ without apical papilla, but with a small subapical globule in a deep pit. Antennal organ III consists of two short blunt and strongly curved rods, guarded by two also proportionally rather short and blunt sense hairs. Another short and curved sensilla at outer surface of same segment (Fig. 36d). Antennal organ I (ventrally on ant₁) composed of two comparatively long blunt sense hairs and a short but otherwise seemingly normal hair (Fig. 36e). Eyes 8 + 8, all well developed though not all equally large (G and H are smaller), in a black eye patch (Fig. 37b). Postantennal organ shortly oval, with an irregular, sometimes rather thick rim; its longest axis is about as long as the diameter of ocellus B (Fig. 37e).

Labral chaetotaxy 2/5, 5, 4. Mandible stout, but essentially normal for the family, with a strongly chitinated outer condyle (Fig. 36 b, c) which is apposed to the interior surface of the clypeus. Maxilla essentially typical with large, three-toothed claw, globular body, and two dorsal and two ventral fringed lamellae, which seem to have a tendency to split (Fig. 36a).

Tibiotarsi of P₁ with one, those of P₂₋₃ with two clavate tenent hairs. Unguis with distinct inner tooth, without lateral or dorsal teeth. Unguiculus with strongly curved inner lamella, tapering to an apical filament (Fig. 36f). Thoracic sternites bare.

Ventral tube with 4 + 4 setae on lateral flaps, and 1 + 1 posterior setae (Fig. 37d). Retinaculum tridentate, with 1 seta on corpus (Fig. 37c). Abdominal sternites bare.

Manubrium anteriorly bare, posteriorly with many (40-60) setae. Antero-distally a pair of strongly sclerotized acute manubrial hooks (Fig. 37a). Anterior face of dens with a large, somewhat variable number (8-15) of setae in distal half; posterior face with about 13 setae and the bosses characteristic for the genus. Mucro typical for the genus, large, two-toothed, strongly lamellate (Fig. 35c, d). Male genital orifice on a tubercle surrounded by a dense row of about 30-40 fine hairs.

Discussion. An inspection of the synoptic key I prepared for *Clavisotoma* (Ellis, 1970), shows that a combination of characters: presence of tooth on the unguis, 8 + 8 eyes, tenent hairs 1, 2, 2, retinaculum tridentate, terminal filament present, has not previously been found in this genus. *C. albertinae* is furthermore highly characteristic by virtue of the large number of setae occurring antero-distally on the dens. *C. albertinae* seems most closely related to *hankoi* (Stach, 1930), described from Hungary and recorded from Switzerland (Gisin, 1960).

In Máráthos (samples 37, 38, 39) we witnessed a true mass occurrence of this species, albeit limited to only 20-30 square metres (as far as could be explored), where countless numbers were walking about on the almost bare, moist clay of a piece of waste land and on stones lying at its edge. We presume that the animals had been (dormant?) living deep in the soil during the dry season, and came to the

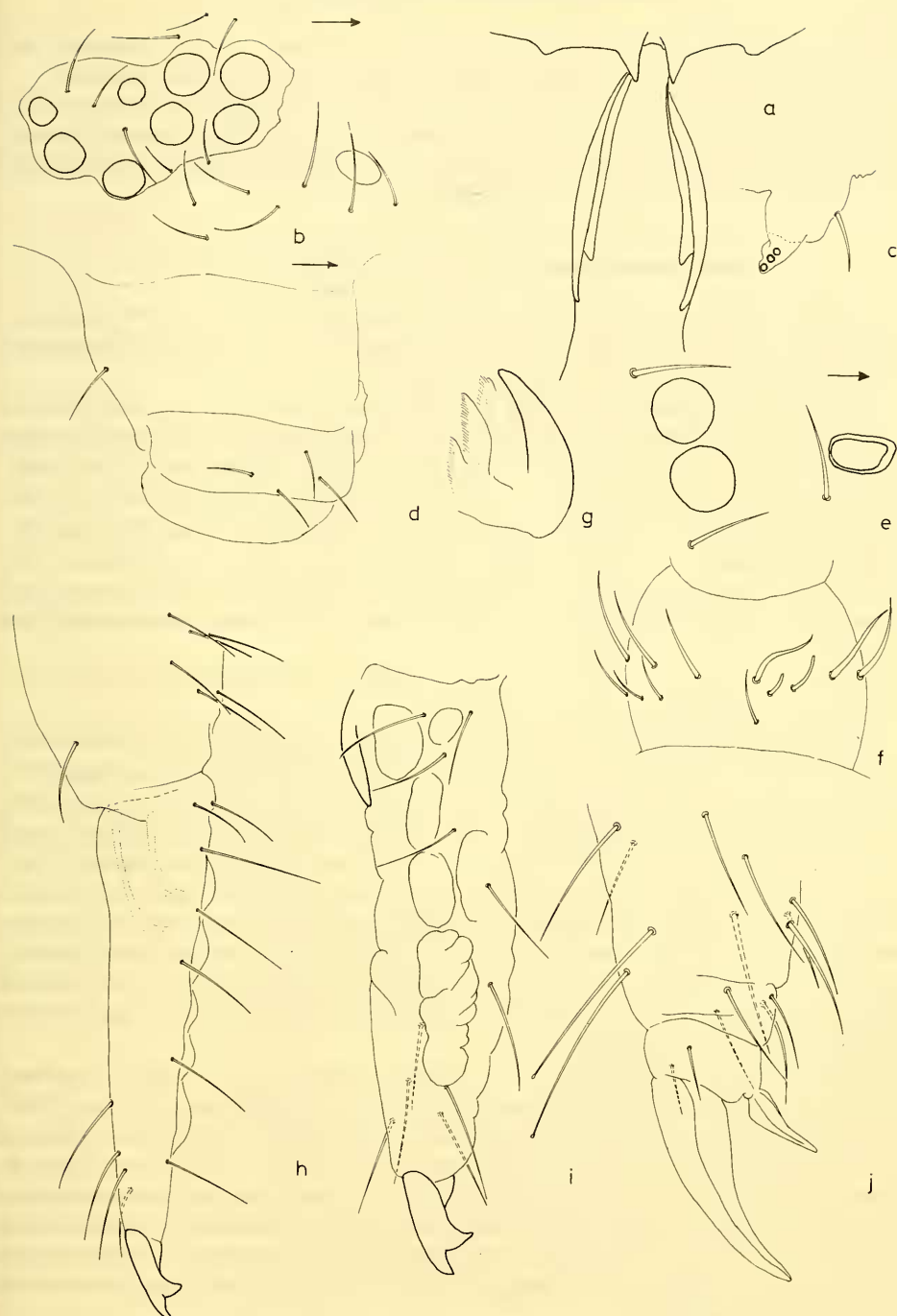


Fig. 37. *Clavisotoma albertinae* n. sp. a, manubrium-dens junction; b, eye patch; c, retinaculum; d, ventral tube; e, postantennal organ and anterior ocelli. *Ballistura schoetti* (Von Dalla Torre). f, ventral aspect of ant., *Dimorphotoma porcellus* n. sp. g, maxillar head; h, lateral aspect of mucrodens; i, ventral aspect of mucrodens; j, claw of P₃

surface — or were actually even driven to the surface — by the soaking and swelling of the clay of the subsoil after the torrential rains of the last few days.

It is a pleasure for me to dedicate this species to my wife Albertine, who not only participated actively in the collecting but also has the gifted collector's knack of finding unusual things in unexpected places. It was she who discovered the mass occurrence of the species under consideration.

***Dimorphotoma porcellus* n. sp. (Fig. 37 g-j, 38, 39, 40 a-d)**

Material: sample 25: 7 ♀ and 1 ♂; 26: 93 ♀ and 69 ♂; 27: 1 ♀; 28: 9 ♀ and 19 ♂. Moreover as alcohol material, not sorted according to sex, about 700 specimens from sample 26. Holotype is a ♂ from sample 26.

Description of female. Total length 1.4 mm (sd = 0.11 mm, n = 12). Habitus stout, about as in *Clavisotoma*. Pigmentation sparse: greyish-blue pigment tinges (without strong concentrations or mottlings) the whole dorsal part of the body, especially the thoracic tergites, and the extremities. Only the enveloping cells around the internal part of the eyes are strongly pigmented. Integument smooth, primary granulation very fine, except in the "crown" on abd₃ (see below). Hair cover dense, consisting of fine, smooth acute setae, only on abd₃₋₆ a bit longer, and sometimes with a few serrations at anterior face; some special setae around the "crown".

Abd₃ well separated from abd₆. Seen from above, abd₆ seems fairly small due to pronounced cryptopygy.

Ant/head ratio is 1.05. Ant 1:2:3:4 = 42:65:66:100. Ant₄ without apical exsertile papilla, but with a slender spine-like sensilla subapically, a small curved sensilla in a shallow groove, many seemingly normal hairs, and dorso-apically (ca. 20) slender curved hair-like but blunt sensillae. Ant₃ with ant. org. III consisting of two small bent sensillae flanked at both sides by a somewhat larger almost straight hair, furthermore a sensilla in the middle of outer face (Fig. 40d); ant₂ with normal setae, one very slender curved blunt sense hair apically in latero-ventral position, and proximo-ventrally as well as proximo-dorsally, a very fine and short hairlet; ant₁ somewhat swollen, proximo-dorsally with a fine setula, ventrally with antennal organ I consisting of a fine sense hair, a shorter curved sense hair, and a short sensilla between them (see Fig. 40b).

Antennal bases swollen, bare; the frontal region seems somewhat jammed between the antennal bases, the hairs pointing in all directions (Fig. 39a). PAO broad-oval, twice as long as diameter ocelli A or B, mostly simple but sometimes with a constriction in the middle of its long axis. Ocelli 8+8, all except G and H equally large (Fig. 39a). Labral chaetotaxy 2/5, 5, 4, distal two rows on low papillae (Fig. 40c). Labium normal; labial palp, see Fig. 39b. Mandible normal for the family (see drawing of *Clavisotoma albertinae*, Fig. 36c). Maxilla also normal, with tridentate claw, globular body, and 2+2 lamellae which do not reach beyond the apex of the claw (Fig. 37g).

Feet 1, 2, 3 with 1, 2, 2, weakly clavate tenent hairs. Unguis without inner of lateral teeth. Unguiculus about 0.5 times unguis, blunt, without apical filament (Fig. 37j). Thoracic sternites 1 and 3 bare, that of th₂ with 1+1 seta.

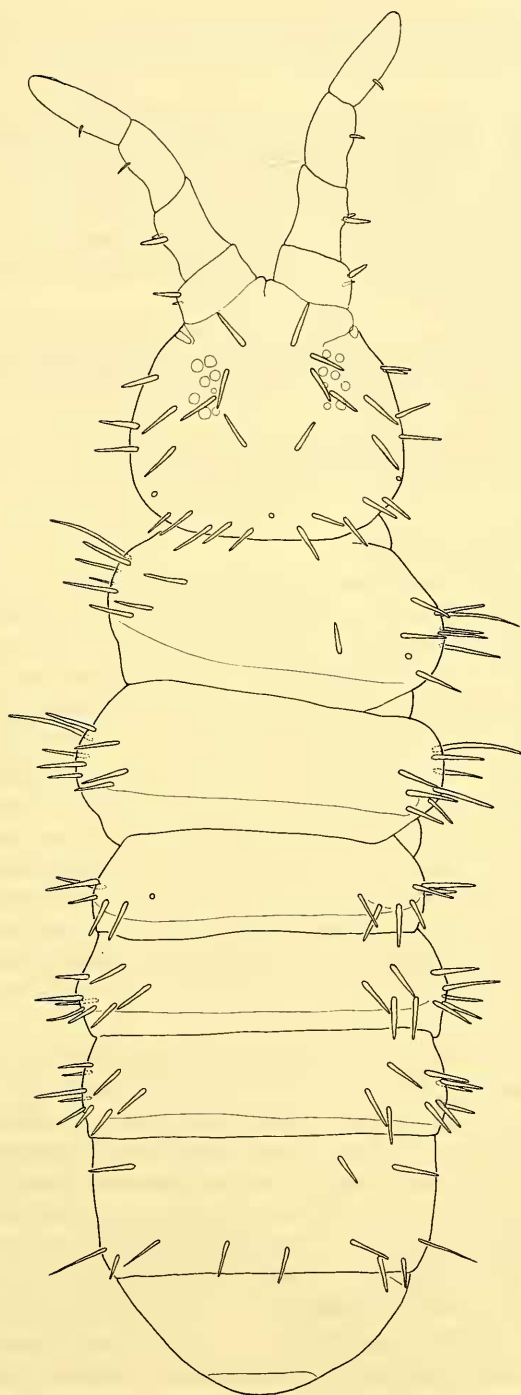


Fig. 38. *Dimorphotoma porcellus* n. sp., habitus of a male

Ventral tube anteriorly without seta, laterally with 4 + 4, posteriorly with 5 + 5 or 6 + 6. Abdomen ventro-medially without setae. Retinaculum tridentate, with one seta on corpus.

Manubrium: dens: mucro = 10: 6: 1. Furca moderately long, reaching to the distal border of abd₂. Manubrium anteriorly with 1 + 1 (seldom 1 + 2) distal setae, posteriorly with many (maximally about 30 + 30) setae, leaving a medial stripe bare. Manubrium-dens junction with two low cushion-shaped ridges (Fig. 39c). Dens anteriorly only distally with 1, 1, 2 setae, posteriorly with a variable number (about 6) of ill-defined humps and 7 setae. Mucro proportionally short, bidentate, lamellate (Fig. 37h, i).

Dorsally on abd₃ there is a rosette shaped like a head of lettuce. It consists of strongly crisped integument that is relatively coarsely grained (granulation visible at x 400). The hairs in this vicinity are longer and more slender and bent than the normal body hairs (Fig. 39e, f).

Female genital orifice of two strongly protruding lips, each having 1 + 1 normal seta, i.e., almost as long as setae anterior and posterior to the genital orifice. Spermatheca not seen.

Description of the male (Fig. 38).

The male is distinctly larger than the female: mean size of 18 random specimens was 1.6 mm (s = 0.15). But the essential difference, very striking even at low magnifications, is the possession by the males of a large number of strong yellow spines on antenna, head, thorax, and abd₁₋₄. Moreover, the hair cover on abd₃ and the expression of the rosette are different, and the antennae are aberrantly shaped.

Ant₄ is roughly normal in shape, differs only in the possession of one small, slightly hook-like spine in lateral position. Ant₃ is somewhat thickened and has a slightly oblique base, and also one lateral spine, which is a bit curved. Ant₂ is distinctly thickened and has two spines of different length, as has ant₁. Ant₁ is even more inflated than ant₂, and the antennal sockets are correspondingly enlarged.

The spines on head and body are essentially aligned along the lateral parts. Although asymmetries and anomalies do occur (e.g. the vertical pair on the head is often absent), the arrangement is essentially a very orderly one. The spines are replaced on abd₃ by strong, straight macrochaetae (sometimes having a few serrations).

The rosette on abd₃ is much less distinct in the male than in the female, and the integument lacks the coarse texture occurring in that sex. The setae on abd₃ (and to a lesser extent also those on abd₆) in the discal area, i.e., close to the rosette, are strongly protracted to a wavy thread, terminating in a tiny globule (Fig. 39d).

The male genital orifice is a large cone, encircled by about 20 setae; papilla bearing 4 + 4 setae (Fig. 40a). Vas deferens visible in a few specimens only.

Discussion. Leaving aside sexual dimorphism, the new species comes close to *Clavisotoma* Ellis, 1970, especially because of the hump structure of the dens. However, the pair of setae antero-distally on the manubrium argues against such a relationship. Otherwise, the resemblance to the littoral *Proisotoma buddenbrocki* Strenzke, 1954, is rather striking. It is unfortunate that no submature males are present in the material, making it impossible at present to say whether the secondary sexual traits are obtained gradually or not.

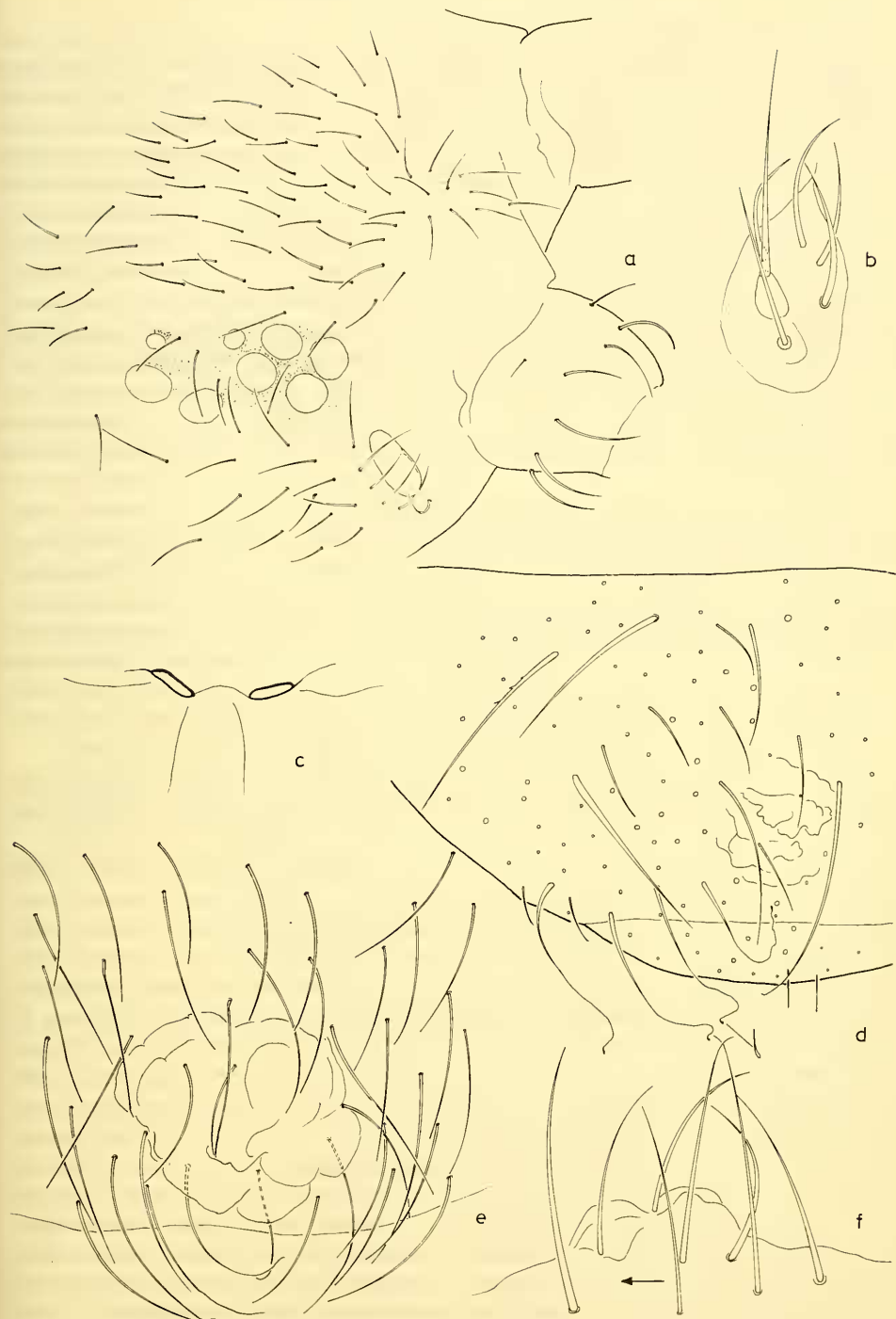


Fig. 39. *Dimorphotoma porcellus* n. sp. a, ♀, frontal region of head in latero-dorsal aspect; b, palpus and lobus externus; c, manubrium-dens junction; d, dorsal aspect of abd₃₋₆ of a male, showing chaetotaxy (only some setae drawn) and the rosette; e, dorsal view of abd₅ of a female; f, rosette of a female in lateral view

Sexual dimorphism on the scale described here is not common in the Isotomidae. A comparatively low degree of dimorphism occurs in *Proisotoma papillosa* Stach, 1937, *Hydroisotoma schaefferi* (Krausbauer, 1898), and *Australotomurus echidnus* (Womersley, 1934). A really strong sexual dimorphism is known to occur in only three instances (which are, however, not undisputed — cf. Goto, 1972): *Guthriella* Börner, 1906, *Rhodanella* Salmon, 1945, and *Dimorphotoma* Grinbergs, 1975 (*Dimorphiella* Grinbergs, 1968, nec Valkanov, 1928). *Guthriella* is much too specialized to be compared with the present species. *Rhodanella*, with only the species *R. minos* (Denis, 1928), is considered by Goto (1972) a possible ecomorph of *Proisotoma stachi* Goto, 1957, although the evidence he gives is not very decisive, and there is no explanation as to why the ecomorphosis would affect only one sex. However this may be, both the type of sexual differentiation (a pair of large horns on the male head, as well as a number of strong but not spiniform body setae) and the female or submature male morphology exclude a close affinity between *Rhodanella minos* and *porcellus*. Note that Denis originally placed *minos* in *Vertagopus*.

Even the similarity to *Dimorphotoma muriphila* (Grinbergs, 1968) is not very strong. In that species the antennae are not affected by the sexual dimorphism, and the rosette on abd₅ with its accompanying specialized setae is not present. Moreover, in *muriphila* abd₄ is strikingly longer than abd₃. Less important differences with respect to *muriphila* concern the occurrence in this species of spines in the male not only dorso-laterally but also dorso-medially, and also on abd₅. Finally, *muriphila* has a tridentate mucro. Still, although I cannot exclude the possibility that by including *porcellus* in *Dimorphotoma* I am making the genus polyphyletic, I think it better not to create a new genus for *porcellus* at present.

The specific name, which means a sucking-pig, refers not only to the plump habitus but also to the roast pig for which Drosiá, the type locality, is widely and rightly renowned.

The species occurred very locally, and in enormous numbers. Very many specimens were seen walking, apparently erratically, on the ground and on large boulders. The collecting date was just after some days of heavy autumn rains, which had thoroughly soaked the loamy subsoil. This and the fact that the material seems to be composed exclusively of adults suggest that the specimens had passed the period of summer drought in the subsoil, and had been driven to the surface by the inundation of their summer resort. Two findings are relevant here: first a comparatively large percentage (in the order of 10%) of the specimens were infected by Sporozoa; and second, the genital area was conspicuously dirty, and I had some difficulty in finding a specimen suitable for a drawing of the male genital papilla. I should also mention that active testicular tissue, which is usually clearly visible even in cleared specimens, could not be found, and the same holds for spermathecae and a distinct vas deferens. In almost all specimens the intestine was full (unidentifiable, mainly amorphous material). My suggestion is that, synchronized as they were by the weather conditions, the specimens had not yet passed through their moult to the sexual phase (c.f. e.g. Joosse & Veltkamp, 1970). No specimens in pre-ecdysis condition were seen.

I have, of course, considered the possibility that *D. porcellus* might only be an

ecomorph. This is not wholly inconceivable after Goto's (1972) study and also because the specimens show some integumentary structures often found in association with ecomorphosis. Moreover, if ecomorphosis were to occur in this species, it would be manifest during the summer drought, and presumably the specimens had not moulted since then. But I reject this possibility for the following reasons:

- (a) the specimens are adult;
- (b) the intestine is usually filled;
- (c) the sexes would show different types of ecomorphosis: restricted to abd₅ in the females, all over the body in the males;
- (d) the general morphology of the animals is very stable, anomalies virtually do not occur; only the arrangement of the spines is somewhat variable, but Isotomidae are usually not very stable in their chaetotaxy; the dental chaetotaxy is very stable;
- (e) eyes, mouth parts, and furca are very constant in shape, and do not present a reduced aspect (only the mucro is a bit short);
- (f) no "normal", "female-type" males are found in the material;
- (g) ecomorphosis due to parasitization seems excluded, since no difference could be found in either sex between heavily parasitized specimens and animals that were virtually free of Sporozoa.

Since care was taken to ensure random selection of both sexes for mounting on slides, the sex ratio $\text{♀/♂} = 1.2$ is approximately correct.

***Isotomiella minor* (Schäffer, 1896)**

Material: sample 4: 3♂ and 8 juv.; 7: 1 juv.; 29: 4 juv.

I. minor is, either primarily or secondarily, a cosmopolitan species. It is only surprising that the species is so rare in Crete.

***Isotoma notabilis* Schäffer, 1896 (Fig. 40e)**

Material: sample 4: 1 juv.; 5: 5 juv.; 6: 2♀ and 5 juv.; 19: 1 juv.; 21: 8 juv. + 20 ex. in alcohol; 24: 18 juv.; 25: 16 juv.; 29: 1 juv.; 35: 12♀ and 10 juv.; 37: 3 juv.; 49: 1 juv.

An extremely common and widespread species.

***Isotoma vaillanti* Murphy, 1958**

Material: sample 14: 8 juveniles.

Note: there can be no doubt that *I. vaillanti* is an ecomorph; but since it is impossible to guess of which species, I continue provisionally to use this name. After its description from mountainous Algeria, *I. vaillanti* was mentioned by Cassagnau (1971a) from the Greek mainland, i.e., the southern part of the Pindos range: Mt. Timfristós (Evritania).

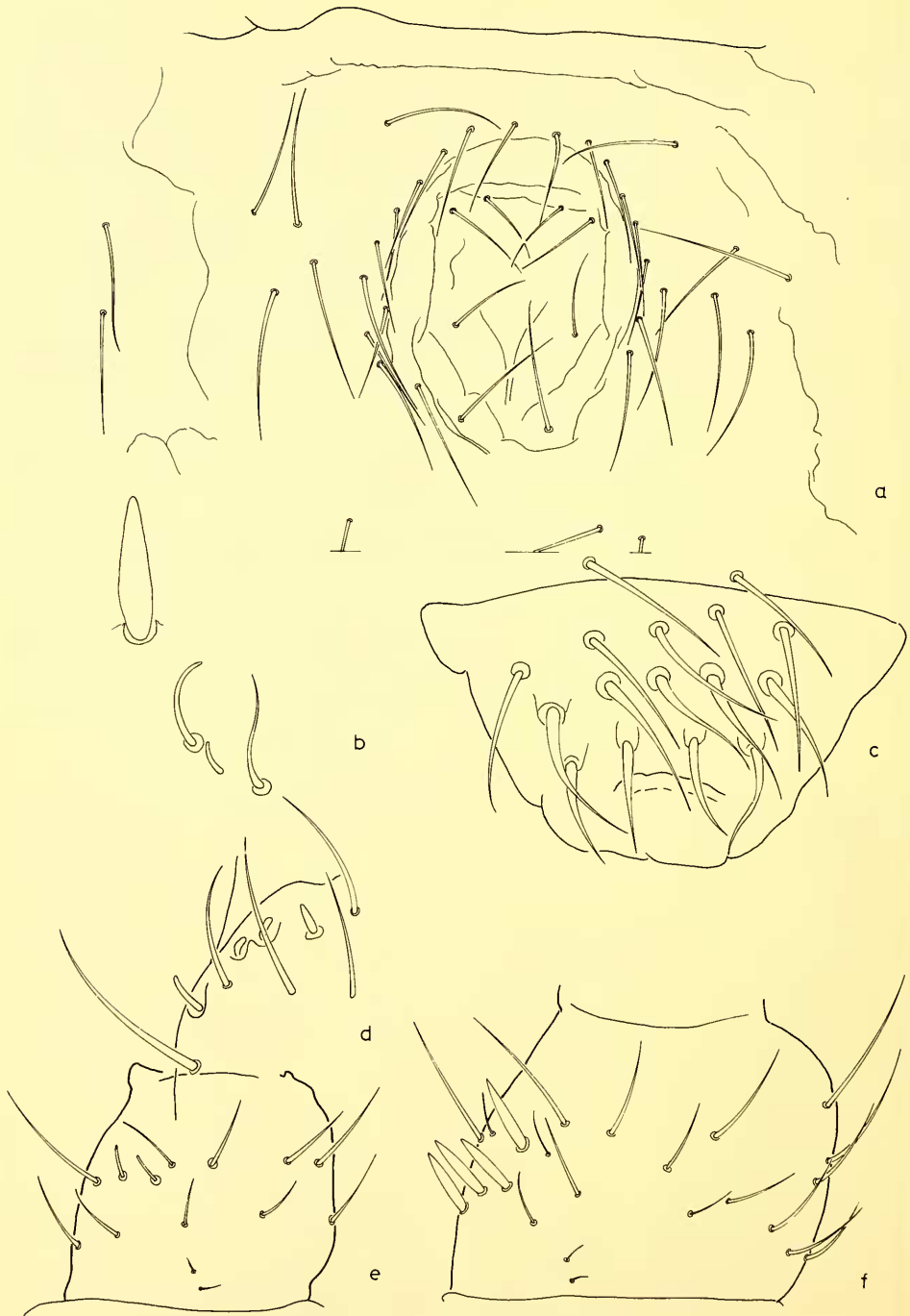


Fig. 40. *Dimorphotoma porcellus* n. sp. a, male genital orifice; b, antennal organ I and guarding thorn of a male specimen; c, labrum; d, antennal organ III. *Isotoma notabilis* Schäffer. e, ventral aspect of ant.₁. *Isotoma olivacea* Tullberg s. auct. f, ventral aspect of ant.₁.

***Isotoma olivacea* Tullberg, 1871 s. auct. (a.o. Gisin, 1960) (Fig. 40 f)**

Material (all immature): sample 23: 7; 31: 1; 41: 1.

The material is comparable to immatures of *I. "olivacea"* from western Europe. Since Dr. A. Fjellberg is preparing a revision of this group, I limit myself to giving a drawing of the antennal organ I (Fig. 40 f; juvenile specimen!).

***Isotoma viridis* Bourlet, 1839**

Material: sample 11: 2 juv.; 19: 4 juv.; 23: 1 juv.; 24: 5 juv.; 26: 3 juv.; 32: 1 juv.; 34: 1 juv.; 36: 2 juv.; 39: 1 juv.; 40: 1 ♀ and 7 juv.; 44: 1 juv.

The high proportion of immatures in *I. viridis* and *Isotomurus palustris* is striking.

***Isotomurus palustris* (Müller, 1776)**

Material: the present material comprises only immature specimens: sample 12: 1; 13: 1; 16: 1; 19: 7; 21: 8; 25: 1; 26: 1; 29: 1; 35: 9; 36: 4; 37: 1; 40: 1; 43: 1; 44: 2; 45: 1.

The larger specimens agree satisfactorily with the current interpretation of *palustris* s. str.

***Isotomurus* spec.**

Isotoma spec. Ellis, 1974.

Material: sample 26: 7 juv.

Discussion. The material in its unmistakable pigmentation agrees with the single (also immature) specimen that I described briefly from Rhodes. My guess that this specimen might be an ecomorph of an *Isotomurus* is corroborated by the fact that the Kriti specimens have much longer and more differentiated setae. The lasiotriches arrangement on abd₂₋₄ is, as far as I can establish 1, 3, 1. The labrum is typical for the genus; mucronal seta absent; lateral flaps of ventral tube with 3+3 setae.

ONCOPODURIDAE***Oncopodura crassicornis* Shoebbotham, 1911 (Fig. 41a)**

Material: sample 6: 2♂; 25: 1♀; 26: 1♀; 27: 2♀; 43: 1♀, 1♂ and 1 juv.; 44: 1 juv.; 45: 1 juv.

Note. The species has already been recorded from Rhodes (Ellis, 1974). The structure of antennal organ I underlines the affinity of the Oncopoduridae to the Isotomidae (Fig. 41 a).

TOMOCERIDAE

Tomocerus lamelligerus (Börner, 1903) (Fig. 41 b-g)

Material: Sample 25: 4 specimens, including at least 1 female and 1 male (the other two may not be fully mature).

Description. Total length 2.2-3.0 mm. Pigmentation very weak, mainly on pleura of th_3 , anterior margin of th_2 , coxae, and frontal region of head. Scales normal, tinged dark brown.

Antennae 0.8-0.9 times body length, first two articles bearing scales. Eyes 6 on a triangular black eye patch. Labral chaetotaxy typical: 4/5, 5, 4; labral margin with 4 recurved spines. Mouth parts seemingly normal, not dissected. "Prostheca" not visible in transparency. Cephalic chaetotaxy seems unstable; anteriorly a group of about 6 setae, discally about 6+6 setae. Rear margin of head with a row of many short spines.

Trochanteral organ of P_3 composed of one stiff seta on trochanter; one identical seta basally on femur (Fig. 41 e). Feet covered with scales up to the tibiotarsi. Tibiotarsal spines present, but difficult to count, because they are caducous and intergrade between strong setae.

Unguis with strong pseudonychia, and on inner lamella 4 teeth plus a slightly stronger basal tooth. Unguiculus without apical filament or outer tooth, but with a small tooth on the anterior of the two inner lamellae only (Fig. 41 b). Tenent hair strong, tubiform.

Abdomen and thorax with lasiotriches lacking accessory scales at the base. Ventral tube with many setae and scales. Retinaculum quadridentate, without scales and with only one seta on the corpus (Fig. 41 c).

Manubrium anteriorly with scales, laterally with a single row of strong setae, posteriorly with two broad longitudinal bands of many setae. Dental spines (Fig. 41 g) in two specimens 3, $\frac{2}{4}$, 1; in the adult female 4, $\frac{2}{1}$, 3, $\frac{1}{1}$, and in the male 5, $\frac{2}{1}$, 1, 3, $\frac{1}{1}$. The basal spines are arranged in an irregular double row (Fig. 41 d). The spines are brown, striate, and complex. Mucro with one apical and one ante-apical tooth, and two basal teeth, the outer one having an accessory tooth. Intermediate teeth are absent. The two basal teeth each have a proximal lamella; the ante-apical tooth gives rise to a very short and low outer lamella, as well as to a conspicuously high, undulating inner lamella that stretches as far as the inner basal tooth (Fig. 41 f). Dentes basally with one pair of inner modified scales, about half as long as the accompanying normal scales.

Discussion. The species is well characterized by the combination of the presence of strongly compound dental spines and a mucro without intermediate teeth but a high lamella. The only species in the European fauna with these characters is *T. lamelligerus* (Börner, 1903), described from Calabria, and later recorded from Bulgaria (Rusek, 1965, citing an inaccessible paper by Drenowski, 1937; the material was identified by Stach) and Yugoslavia (e.g. Cvijović, 1972). A similar mucro is described in *T. terrestralis* (Stach, 1922) which has the dental spines simple, and the North American (Californian) species *T. teres* Christiansen, 1964, which differs by having the dental spines essentially simple and the tenent hair pointed or only weakly clavate.



Fig. 41. *Oncopodura crassicornis* Shoenbotham. a, ventral aspect of ant₁, *Tomocerus lamelligerus* (Börner). b, claw of P_3 ; c, retinaculum; d, arrangement of dental spines; e, trochanter and basal part of femur of P_3 with trochanteral organ; f, mucro; g, dental spines, inner view

Since Börner's description is exceedingly concise, and consequently the identification of the Greek material was not beyond doubt, I compared the Cretan specimens with a topotypical specimen, kindly loaned to me by Dr. R. Dallai, from Sienna. This specimen, an immature collected in Palmi, Calabria on 27 March, 1972, was mounted, and the chaetotaxy could not be studied. However, all other structural details agreed with the Greek specimens. The strong tooth on the inner lamella of the unguiculus mentioned by Börner is less pronounced in the specimen seen, much as in the Cretan examples.

CYPHODERIDAE

***Cyphoderus albinus* Nicolet, 1841**

Material: 2 specimens from sample 49.

The species has a very large distributional area covering Europe.

***Cyphoderus* spec. cf. *maroccanus* (Delamare, 1948) (Fig. 42 a, b)**

Material: sample 5: 1♂ and 1 presumably juvenile specimen.

The proportionally short mucro (1/7 times dens) places these specimens within the group singled out by Delamare as *Cyphoda*.

In one specimen (the male) there are 5 outer and 5 inner scales on the dens, but I am not completely certain about the number in the other specimen; in both specimens the internal apical scale is at least twice as long as the exterior one. The mucro has a vestigial subapical tooth (Fig. 42 a). The unguis has only one of the basal teeth strongly developed. An unpaired tooth is lacking in most claws, but was seen in one instance (Fig. 42 b).

The related species *C. grassei* (Cassagnau & Delamare, 1948), differs by the very narrow basal tooth on the unguis, and in having a distinct tunica.

It is very hard to allocate the two specimens: the shape of the mucro and the distributional evidence point towards identification as *grassei*, but the shape of the claw suggests *maroccanus*.

TROGLOPETETIDAE

***Troglopetetes cretensis* n. sp. (Fig. 42 c-e, 43 a-e)**

Material: sample 35: 1; 38: 1; 44: 2; 45: 1; 46: 3; all specimens of unknown sex, perhaps largely immature, except one ♀, the holotype, from sample 46.

Description. Total length of largest specimen, the holotype, 1.0 mm; remaining specimens 0.7-0.8 mm.

Colour white, no trace of pigment, scales in large specimens with a brown hue. Habitus paronelloid, with the conspicuous long and stiff furca.

Antennae twice head diagonal. Ant. 1: 2: 3: 4 = 3.5: 6.5: 4.8: 10.0. Ant₄ divided into two equal parts by a distinct suture. Ant₁₋₂ dorsally with some scales. Ant₁ dorsally in basal position with 4 small spines, ventrally with 2 small sensillae and 3

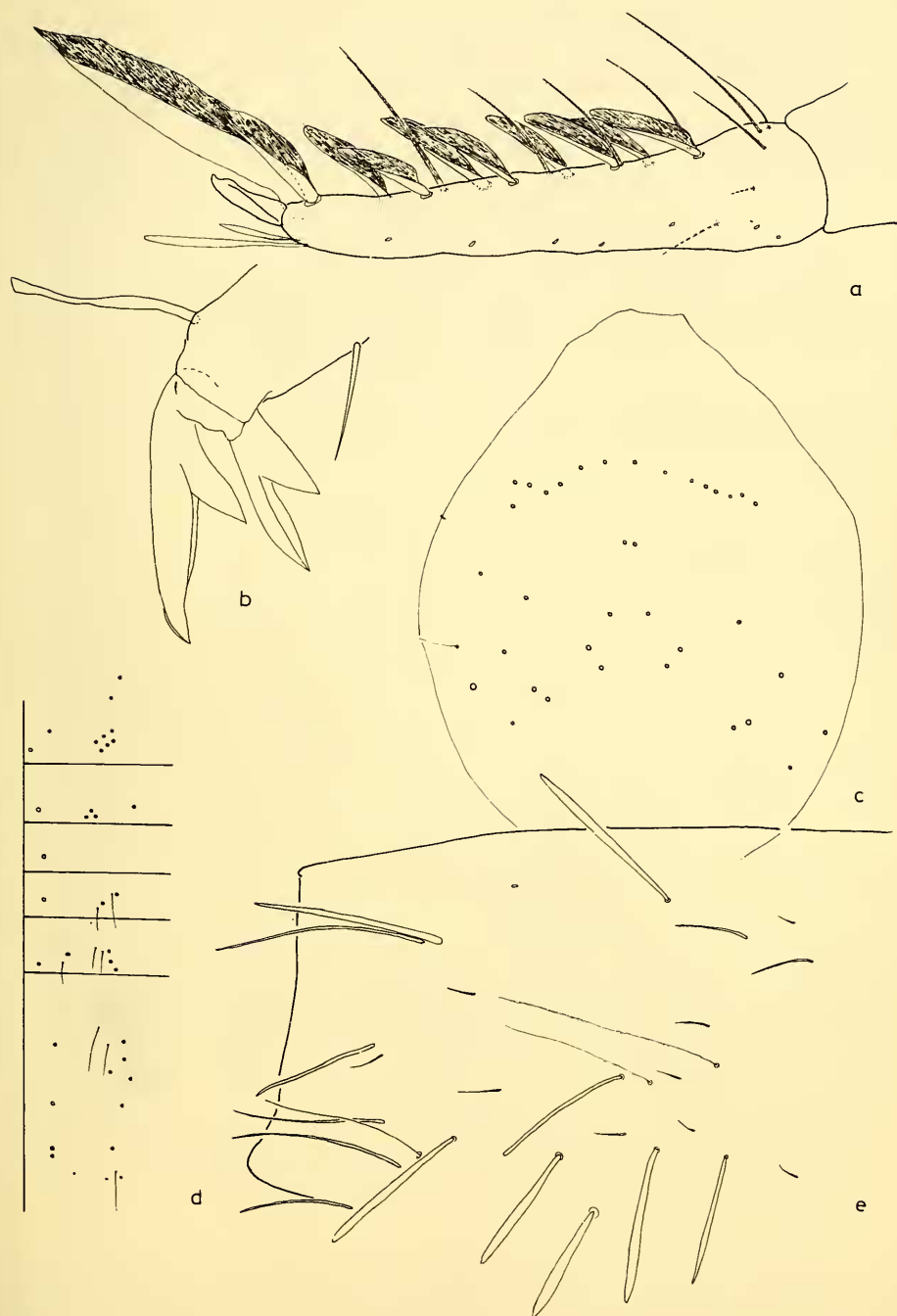


Fig. 42. *Cyphoderus* cf. *maroccanus* (Delamare). a, mucrodens; b, claw of P₃. *Troglopedetes cretensis* n. sp. c, cephalic chaetotaxy; d, diagram of body chaetotaxy; e, latero-distal hair cover of abd₄.

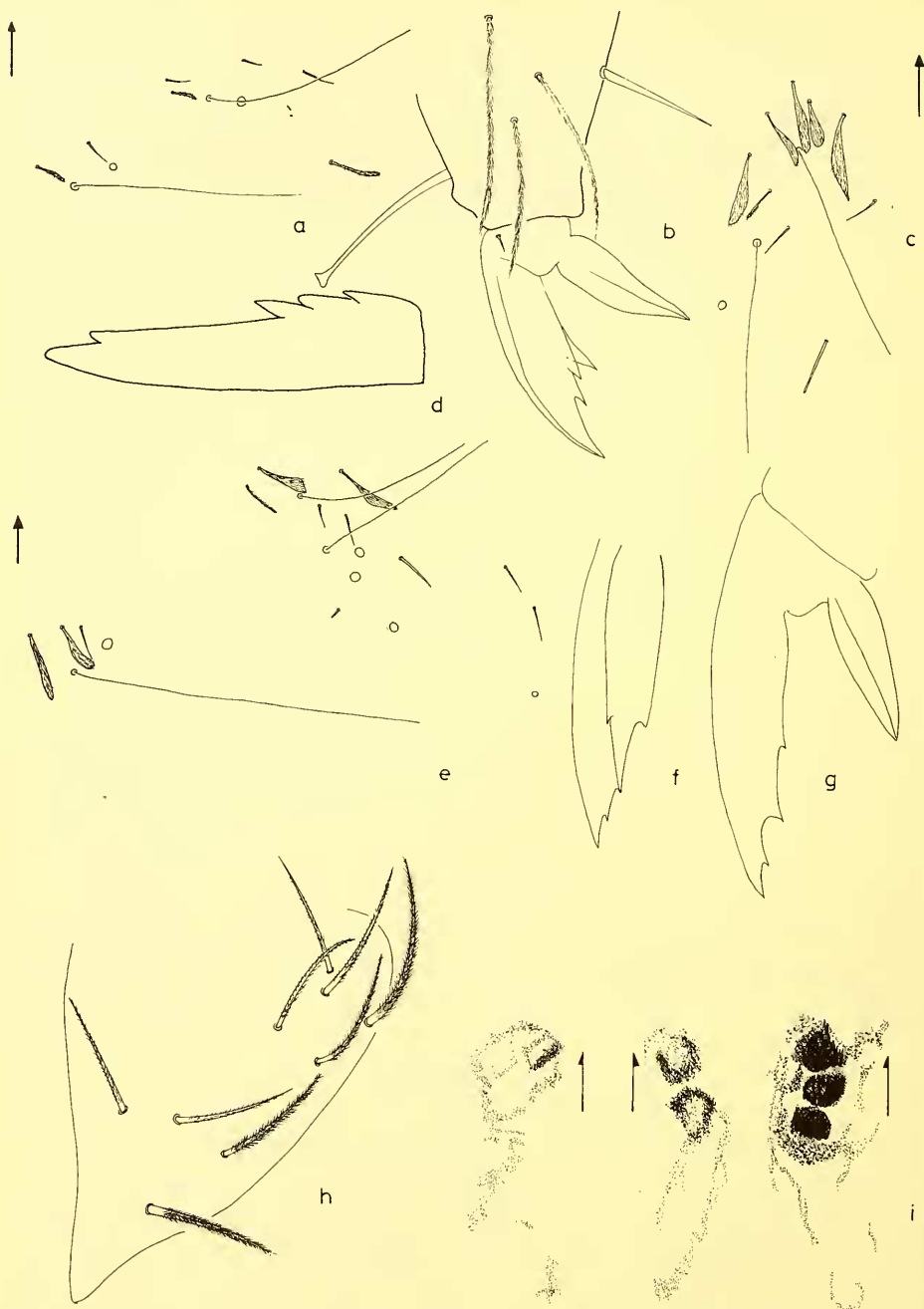


Fig. 43. *Troglopedetes cretensis* n. sp. a, lasiotriches and accompanying structures of abd₂; b, claw of P₃; c, lasiotriches and accompanying structures of abd₄; d, mucro; e, lasiotriches and accompanying structures of abd₃; *Pseudosinella paprivata* n. sp. f, inner carina of unguis; g, claw of P₃; h, labial chaetotaxy; i, eye patches of three specimens at the same magnification (interference contrast microscope), to show variability in number of ocelli

sense hairs. Ant₂₋₄ with many smooth sense hairs of variable length, and with a small number of sensillae in the form of a very short spine (type F of Christiansen, 1958); sensillae of type B — short sense hairs, apically dilated and cleft — not found. No apical retractile papilla. Mouth parts normal for the family group. Labral margin with (4?) globular thickenings that I could not analyse. Prelabral setae 4/5, 5, 4. Labral chaetotaxy quite comparable to that of *Lepidocyrtus*: M₁M₂rEl₁L₂; not only r but also l₁ in the form of a short spine.

Ocelli absent. For cephalic chaetotaxy, see Fig. 42 c.

Feet without scales. Trochanteral organ composed of 9 smooth spines. Femora and tibiae with plumose hairs and a small number of sensillae (?) of type F referred to above. Tibiotarsus₃ with smooth supra-empodial hair; tenent hair distinctly clavate. Unguiculus rather broad, untoothed, unguis with well-developed basal teeth and one strong unpaired tooth (Fig. 43 b).

Ventral tube with a limited number of plumose setae at anterior and posterior faces; anterior face not easily studied, posterior with 3 + 3 type F sensillae and at least one pair of scales. Retinaculum quadridentate, corpus without scales, having only one median hair.

Manubrium: dens: mucro = 10.0: 5.8: 1.7. Manubrium anteriorly and laterally scaled, posteriorly with ciliate setae. Dens anteriorly with large scales — the distal ones as long as the mucro — posteriorly with ciliate setae and postero-internally with a row of at most 15 simple smooth spines. The spines are distally slightly longer than basally; in the middle of the dens they are half as long as width of dens. Mucro almost 5 times as long as maximally thick, with apical and subapical teeth, and postero-basally 3 or 4 sawteeth (Fig. 43 d).

Body chaetotaxy oligochaetotic (Fig. 42 d). Each segment with one pair of pseudopores. Lasiotriches: one pair on head, 2, 3, 3, on abd₂₋₄, showing accompanying modified scales at their bases. Many microchaetae, a number of which on abd₄ are conspicuously long (Fig. 42 e, 43a, c, e).

To give an impression of the variability of some characters, Table 7 shows some data on the length of the specimens, the number of dental spines, and the number of dorsal teeth on the mucro.

Discussion. The new species is very close to *T. cavernicola* Delamare, 1944, described in great detail from some caves in Portugal. Differences are: the mucro is narrower in *cavernicola* with only two basal teeth (apparently constantly) and the

Table 7. Total length and numbers of dental spines and dorsal teeth of mucro in *Troglopedetes cretensis* n. sp.

Length (mm)	dental spines	mucronal teeth
1.0	15 + 15	3 + 3
0.8	12 + 12	3 + 4
0.8	? + 12	3 + 3
0.8	10 + 10	3 + 4
0.7	9 + 12	3 + 4
0.7	9 + 10	2 + 3
0.7	8 + 9	3 + 4
0.6	12 + 12	3 + 3

tenent hair in *cavernicola* is very weakly clavate. There are also differences in some chaetotactic details although in interpreting Delamare's drawing of the chaetotaxy of *cavernicola* one must include the pseudopore, which was not known at that time. The th_2 of *cavernicola* are stated to show 3-4 insertions on each side within the groups of six setae; in *cretensis* this is 1 + the pseudopore. In th_3 *cavernicola* has 3 + 3 insertions within the groups of 3; in *cretensis* this is 0 + the pseudopore. In abd_4 *cavernicola* has 4 strong macrochaetae lateral to the anterior lasiotriches; in *cretensis* there are 5.

ENTOMOBRYIDAE

Heteromurus major (Moniez, 1889)

Material: sample 11: 1 ex.; 13: 2 ex.; 19: 1 juv.; 25: 2 ex. (1♂); 26: 3 ex. (1 juv., 1♂); 27: 4 ex. (2♀); 29: 4 ex. (1♀, 2♂); 31: 2 ex. (1♂); 35: 2 ex. (1♀ and 1 juv.); 38: 1 juv.; 43: 1 juv.

Discussion. The material is in good agreement with the specimens recorded earlier by me (1974) from Rhodes. Labial chaetotaxy is again MMREIL, and this very constantly. The smooth seta l_1 , also drawn by Hühner (1970), is peculiar. These results are somewhat at variance with the information given by Martynova, Chelnokov & Rasulova (1974), who report a rather strong variability in the labial chaetotaxy of southeastern Russian *major* (MMR-IL, MMREIL, MM/m . . .l, MMREIL) in which l_2 seems to be the only seta which is constantly smooth.

Heteromurus sexoculatus Brown, 1926, bona species

Material: sample 5: 1 ex.; 6: 1 ex.

Discussion. The good luck of finding two more specimens of *H. sexoculatus* gives me the opportunity to revise my earlier opinion that *sexoculatus* is a variety of *major*, since they showed two characters which could be confirmed in the specimen from Rhodes.

The labial chaetotaxy is not completely stable, but either $M_1m_2rel_1l_2$ or $m_1m_2rel_1l_2$ (m_1 is about $2/3$ the length of m_2). In one specimen this occurs asymmetrically; in another, seta r is symmetrically absent. However this may be, the number of smooth setae is much higher than in *H. major*. In conjunction with this the setae at the ventral face of the head are smooth or almost so, only becoming gradually more serrate towards the proximal and lateral regions.

The posterior face of the manubrium bears some pairs of stiff erect and virtually smooth setae, about 1.5 times the length of the normal serrate setae. The number of these hairs is difficult to establish, since they tend to fall out easily, and the number is perhaps variable; in any case, one pair is situated very proximally, and another $3/4$ of the distance from base of manubrium; in one specimen such a seta was also observed on the dental base. Setae of this type are missing in *major*, but are present in *nitidus* and related species. No smooth setae are present on the tibiotarsi. Body chaetotaxy as in *major*.

I asked Mr. P. N. Lawrence of the British Museum whether the types of *H. sexoculatus* were still extant, and he informed me that the whereabouts of Brown's collection are unknown.

***Heteromurus nitidus* (Templeton, 1835)**

Material: sample 9: 1 juv.; 24: 1 juv.; 38: 1 ad.

The species has been recorded throughout Europe.

***Pseudosinella octopunctata* Börner, 1901**

Material: sample 4: 2 ♀ and 2 ♂; 5: 1 ex.; 6: 1 ex.; 10: 1 ♀; 11: 3 ex. (1 juv.); 12: 1 ex.; 14: 1 ♀; 20: 1 ♀; 26: 1 ex.; 29: 2 ex. (1 ♂); 30: 1 ex.; 32: 4 ex. (1 ♀); 36: 2 ex. (1 ♂); 42: 2 ex.; 45: 1 ex.; 48: 1 ex.

The species has already been recorded from Rhodes (Ellis, 1974). Recently, Da Gama (1973) recorded it from Turkey.

***Pseudosinella albida* (Stach, 1930)**

Material: sample 9: 1 ad.; 25: 2 ♀ and 1 juv.; 31: 2 ♂; 36: 1 ♂.

Discussion. The material agrees with the description given by Stomp (1971), but the pigmentation is much stronger, as is normal for Greek material (Stomp, 1972). There is a contradiction between Stomp's descriptions of 1971 and 1972 as to the presence of seta *s* on abd₄. In the present material seta *s* is indeed present, as stated in the earlier publication. The species seems to be common in Greece (see also Da Gama, 1973), and is also known from Spain and Italy.

***Pseudosinella imparipunctata* Gisin, 1953**

Material: sample 4: 1 ♂; 11: 1 ♀; 14: 1 ex.; 16: 1 ex.; 21: 1 ex.; 34: 1 ♀; 35: 1 juv.; 43: 1 ♀.

Discussion. The material agrees with the literature in most currently available characters: labial chaetotaxy MrELL, chaetotaxy of abd₂ pABQq, seta *s* lacking on abd₄, body macrochaetae R111/10/030+2, no scales on ant₁. The unguis is as described by Gisin (1953), closely resembling that of *alba* (Packard, 1873).

However, the configuration of the eyes is not completely in agreement with the original description. Most of the specimens show two distinct, well-pigmented eyes, subequal and separated by slightly less than their diameter. In the two ♀ mentioned above, the eyes on one side are much closer to each other, almost touching (and again subequal). In the immature from sample 35, one side shows 3 subequal, well-spaced eyes, lying in a straight row.

P. imparipunctata was described from Switzerland, and has been recorded from Spain (Selga, 1973), Portugal (Da Gama, 1961), Germany (Hüther, 1961), and Bulgaria (Kosarov & Zonev, 1966).

***Pseudosinella paprivata* n. sp. (Fig. 43 f-i, 44 a, b)**

Material: sample 5: 3 ♀, 1 ♂, 2 immature ♂, 7 specimens of unknown sex, partly juv.; 9: 1 juv. (identification not definite, excluded from type-series); 27: 1 ♀, 4 juv.; 44: 2 juv. Holotype is a ♂ from sample 5.

Description. Total length 0.6 mm. Habitus normal. Scales thin. Some pigment only in and around the poorly delimited eye patch.

Antenna 1.4 times head diagonal. Ant 1:2:3:4 = 3.8:5.2:5.9:10.0. No scales on antenna.

Eye number very difficult to establish (cf. Fig. 43 i). In samples 27 and 44, 3 pigmented corneae are visible; in sample 5 (and in the doubtful specimen from sample 9) mostly 2 + 2, but sometimes virtually 1 + 2 or 1 + 1 ocelli can be counted. Since no other distinction could be made within the material, these differences, if real, are not considered important. Labial chaetotaxy in all specimens except 2 ♀ and 1 juv. from sample 5: M-ELL; in the three specimens mentioned: MrELL. Evidently, the reduction of seta r has led in most specimens to its total suppression. The row of setae anterior to the prelabial setae are also ciliate, though less than the prelabial ones, just as in *P. ciliata* Ellis, 1974 (Fig. 43 h).

Feet without scales. Empodium lanceolate. Tenent hair feebly clavate. Unguis with comparatively weak basal teeth, inserted rather high, and two comparatively strong distal teeth (Fig. 43 f, g).

Abd₂ with a rather special chaetotaxy, formulated as: --Bqq. Not only are p and a constantly absent, but also the exterior of the two microchaetae in front of the lasiotriche is absent, and at its site there is a small scale (Fig. 44 a). Abd₄ without seta s; seta a well ahead of e (Fig. 44 b). Arrangement of macrochaetae: R011/10/0101 + 2.

Mucro with subequal teeth.

Discussion. The constant absence of both a and p on abd₂ places this species in an isolated position among all European species described so far. It is generally agreed that *Pseudosinella* is derived polyphyletically from *Lepidocyrtus*, largely through some still extant stem species. In the present case, however, I do not know of a *Lepidocyrtus* species from which this form could have been derived.

***Lepidocyrtus lignorum* (O. Fabricius, 1775) (Fig. 44 c, d)**

Material: sample 6: 1 ex.; 20: 1 ex.; 21: 1 juv.; 23: 1; 25: 1; 30: 3 (2 juv.); 31: 3 (1 ♀); 36: 1 juv.; 37: 1 ♂; 38: 4 (2 ♀); 45: 1 juv.; 50: 3 (1 juv.).

Discussion. The specimens are in good agreement with West European material of this species, except that in some of the largest specimens the labial chaetotaxy shows some (symmetrical) duplication, resulting in the presence of an accessory seta M₁' and two setae R', R'' (Fig. 44 c). But most specimens show the normal labial chaetotaxy M₁M₂REL₁L₂. Other characteristics of the species are: scales present on femora and tibiae and on ant₁₋₃, body chaetotaxy R001/00/0101 + 3, chaetotaxy of abd₂: paBqq, seta s lacking on abd₄.



Fig. 44. *Pseudosinella paprivata* n. sp. a, chaetotaxy of abd_2 ; b, anterior lasiotriches of abd_4 with associated microchaetae. *Lepidocyrtus lignorum* (O. Fabricius). c, labial chaetotaxy; d, ventral tube, anterior view. *Lepidocyrtus lignorum* forma ? e, pigmentation of abd_{3-4} . *Lepidocyrtus serbicus* Denis. f, ventral tube, anterior view

Lepidocyrtus lignorum forma? (Fig. 44 e)

Material: sample 25: 2 specimens.

Discussion. The specimens agree morphologically in all details with *L. lignorum* (which occurred in the same sample). However, they show a pigmentation pattern I do not remember ever having seen in *lignorum*: two broad spots on abd₃, almost filling the dorsum of that segment, leaving only a median uncoloured spot and two smaller marks postero-laterally on abd₄. Also pigmented are the frontal ocellus and — weakly — the antennae. Eye patches black as usual.

It is interesting to regard this material in relation to the "*lignorum* var.?" mentioned by Da Gama (1973) from the Peloponnesus and the Ionian islands. Here, however, abd₂ and abd₃ are entirely pigmented, as well as the posterior corner of abd₄. The relation between these two forms and *L. instratus* Handschin, 1924, from Switzerland and east-central Europe, merits closer study.

Lepidocyrtus serbicus Denis, 1936 (Fig. 44 f)

Material: sample 15: 1 ex.; 19: 1♂; 21: 1♀; 24: 2♀; 25: 13 ex. (at least 3 adults and 1♀); 27: 8 ex. (at least 2♀ and 2♂); 35: 2 ex. (1♀); 37: 1 ex.; 44: 1 ex.

Discussion. The material is in good agreement with the descriptions, but some clearly immature specimens seem to lack seta M₁ on the labium. Otherwise, the characters of *serbicus* are stable: body chaetotaxy R111/00/0101+2; antennae and feet without scales; labial chaetotaxy M₁M₂REL₁L₂; chaetotaxy abd₂: p-B-q₂; seta s lacking on abd₄ (and seta e rather longer than the others).

Lepidocyrtus serbicus, described from Yugoslavia, has been recorded from Poland (Szeptycki, 1967), and Romania (Gisin, 1965). Although some references are ambiguous, on the European mainland *serbicus* seems to be usually cavernicolous.

Seira graeca Ellis, 1966 (Fig. 45 a)

Seira pillichii graeca Ellis, 1966.

Seira ferrarii; Ellis, 1974.

Material: sample 38: 1♀.

The study by Dallai (1973), unfortunately received only at the end of 1974, convinced me of the importance of the chaetotactic details of th₂, and forced me to re-examine my material from central Greece and Rhodes. The posterior group of macrochaetae on th₂ proved to consist of a tight group of 7+3+5 macrochaetae (Fig. 45 a). Only in two not fully mature specimens from Rhodes was 6+3+5 found asymmetrically.

Dallai (1973) cites two differences between *S. ferrarii* Parona, 1888, and *S. sacchii* Parisi, 1969: (1) *ferrarii* has 6+3+5, *sacchii* 7+3+5 macrochaetae posteriorly on th₂, and (2) *ferrarii* has 8, as against 10 macrochaetae *sacchii* has in the transverse row between eye patch and frontal ocellus. *S. graeca* and *ferrarii* differ only in th₂ chaetotaxy, and thus the only remaining difference between *graeca* and *sacchii* would be the interocular macrochaetae. As a matter of fact, in

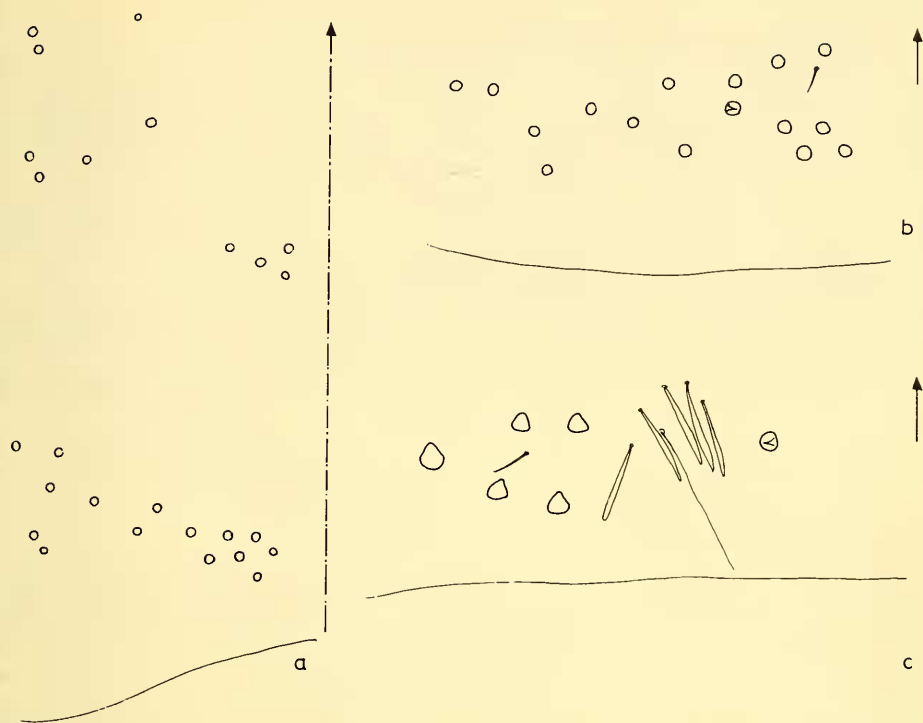


Fig. 45. *Seira graeca* Ellis. paratype. a, chaetotaxy of th_{1-2} . *Seira* spec. b, chaetotaxy of th_3 ; c, dorso-medial chaetotaxy of abd_2 .

graeca this number is 8+8 or, almost as frequently, 8+9. The difference between *graeca* and *sacchii* is thus very small indeed. *S. sacchii* is so far known only from Italy.

Seira spec. (Fig. 45 b, c)

Material: sample 46: 1 ♀.

The habitus of the living animal is unknown, but in chaetotactic details the specimen is very close to *S. dagamae* Dallai, 1973, except for one clear feature: th_3 , which has 14 paramedian macrochaetae in *dagamae*, has 15 in the present specimen; in particular, the group postero-internally from the pseudopore has one macrochaeta more. I cannot evaluate this specimen at present (Fig. 45 b).

For convenience, I present below a practical key to the European *Seira* of which the chaetotaxy is known.

- | | |
|--|---|
| 1. Discal group of th_2 with 4 setae; anterior row on abd_4 simple | 2 |
| — Discal group of th_2 with more than 4 macrochaetae; anterior row on abd_4 double | 7 |
| 2. Paramedian group of abd_2 with 5 macrochaetae | 3 |
| — Paramedian group of abd_2 with 4 macrochaetae | 5 |

3. Posterior group of th_2 with 15 macrochaetae 4
- Posterior group of th_2 with 18-20 macrochaetae
..... *domestica* Nicolet, 1841
4. Paramedian group of th_3 with 14 macrochaetae
..... *dagamae* Dallai, 1973
- Paramedian group of th_3 with 15 macrochaetae
..... unnamed species (see p. 315)
5. Posterior field of th_2 with 14 macrochaetae *ferrarii* Parona, 1888
- Posterior field on th_2 with 15 macrochaetae 6
6. Between eye patch and frontal ocellus, 8-9 macrochaetae
..... *graeca* Ellis, 1966
- Between eye patch and frontal ocellus, 10 macrochaetae
..... *sacchii* Parisi, 1969
7. th_3 with postero-medial group (behind pseudopore) of 7-9 macrochaetae
..... *lusitanica* Da Gama, 1964
- th_3 with postero-medial group of 4 macrochaetae
..... *squamoornata* (Schtscherbakow, 1898)
- th_3 with postero-medial group of 3 macrochaetae 8
8. Discal field of th_2 with 7 macrochaetae
..... *pallidipes* Reuter, 1895, sensu Loksa & Bogojević, 1970
- Discal field of th_2 with 10-11 macrochaetae 9
9. Anterior macrochaeta of intermediate group of abd_4 twice as far from
posterior seta in this group, as from its lateral neighbour
..... *saxatilis* Gisin & Da Gama, 1962
- Three times this distance *dollfusi* Carl, 1899

S. arenaria Da Gama, 1966, *banyulensis* Denis, 1924, *italica* (Cassagnau & Delamare, 1953) and *petrae* Jacquemart, 1973, are considered synonyms of *S. ferrarii*.

Entomobrya muscorum (Nicolet, 1841)

Material: sample 8: one adult specimen.

The specimen is very pale, and the meagre pigmentation resembles most closely that of *E. pazaristei* Denis, 1936. However, the extremely long antennae of the specimen are more in favour of an identification as *muscorum*. The species has been recorded from some central European countries, Madeira, and North and South America (South, 1961).

Entomobrya handschini Stach, 1922

Material: sample 15: 3 ♀, 7 adults of unknown sex and 1 juv.; 22: 1 ♀, 3 adults of unknown sex and 1 juv.; 26: 1 juv.; 27: 1 juv.; 38: 4 ♀ and 2 ♂.

This characteristic species, one of the few truly epigeic species encountered in Crete, was described from Hungary, and has since been recorded from many countries in south-eastern Europe and from Spain.

***Entomobrya multifasciata* (Tullberg, 1871)**

Material: sample 15: 3 adults; 22: 7 ♀, 2 ♂, and 1 juv. + 7 ex. in alcohol; 27: 1 juv.; 38: 1 ♀, 1 ♂, 1 juv., and 3 adults of unknown sex, + 7 ex. in alcohol.

This common European species has already been recorded from Rhodes.

***Entomobrya cf. multifasciata* (Tullberg, 1871)**

Material: sample 23: 1 ♀, 1 ♂ and 2 specimens of unknown sex; 32: 1 ex.; 33: 1 ♂ and 3 juv.; 42: 1 ♂ and 2 juv.; 49: 2 ex. (1 juv.).

All these specimens are wholly or almost entirely depigmented; the few traces of pigment and the few reliable morphological characters do not contradict identification as *multifasciata*.

NEELIDAE

***Megalothorax incertus* Börner, 1903**

Material: sample 23: 1 ex.; 25: 2 ex.; 27: 1 ex.; 35: 1 ex.; 36: 2 ex.; 43: 2 ex.; 44: 3 ex.; 45: 2 ex.

The species has already been recorded from Rhodes. I am not completely convinced as to the identification of the specimen from sample 23.

SMINTHURIDIDAE

***Sminthurides malmgreni* (Tullberg, 1876)**

Material: sample 26: 1 ♀, 3 ♂, and 5 juv.

The species has been recorded from most European countries, North America, and Japan; records from the southern Palaearctis include Portugal, Spain, Yugoslavia, Romania, N. Africa, and the Azores.

***Sphaeridia pumilis* (Krausbauer, 1898) sensu Massoud & Delamare
Deboutteville, 1964**

Material: sample 6: 1 ♀; 7: 2 ♀ and 1 ♂; 10: 4 juv.; 17: 1 ♂; 18: 5 ♀, 3 ♂, and 9 juv.; 19: 1 ♀; 21: 1 ♂ and 2 juv.; 23: 6 ♀ and 2 ♂, and about 120 ex. in alcohol; 24: 1 ♀ and 2 ♂; 25: 3 ♀; 26: 3 ♀; 27: 2 ♀ and 2 ♂; 29: 1 ♀; 32: 10 ex. in alcohol; 33: 7 ♀ and 3 ♂; 34: 2 ♀; 35: 2 ♀; 36: 4 ♀ and 1 ♂; 37: 1 ♀; 41: 1 ♂; 42: 2 ♀; 43: 1 ♀; 45: 1 ♂; 49: 1 juv.

This common and widespread species has already been recorded from Rhodes.

SMINTHURIDAE

***Arrhopalites* spec.**

Material: sample 4: 1 juv.; 25: 2 juv.; 43: 1 juv.; 44: 4 juv.

The material is too young to permit speculation about the species identification.

Sminthurinus aureus (Lubbock, 1862)

Material: sample 4: 3 juv.; 6: 1 ♀; 7: 2 ♂; 23: 3 juv.; 24: 1 juv.; 36: 5 juv.; 41: 5 ♀, 3 ♂, and 4 juv.; 43: 1 ♀.

Discussion. The identification of isolated immatures (samples 4, 23, 24, and 36) can of course only be conjectural. The species is widespread throughout Europe. None of the specimens shows the "typical" yellow coloration; all are marked with blue, usually well-delimited patches, which in some instances cover the major part of the body. The general habitus is rather similar to that of *S. reticulatus* Cassagnau, 1964, from the Pyrenees.

Sminthurinus spec. aureus group

Material: 3 immatures from sample 18.

Sminthurinus alpinus bisetosus n. ssp. (Fig. 46 a, b)

S. spec. near alpinus Gisin, 1953; Ellis, 1974.

Material: sample no. 970.010 from Rhodes, Línos, 1 ♂ and 1 juv.; from Kríti, sample 19: 2 juv.; 21: 1 ♂; 23: 4 juv.; 24: 1 juv.; 27: 6 juv.; 31: 1 ♂; 43: 1 ♂; 44: 1 ♀. Holotype: the female from sample 44.

In the discussion on the two specimens from Rhodes, I noted as divergent from *S. alpinus* Gisin, 1953, the two (instead of one) setae on the corpus tenaculi and the number of setae in the eye patch ("two, as seen in profile" — instead of one). Now that I have more material, the latter observation seems rather dubious. Young specimens, with the eye spot slightly transparent, seem to have only one seta in the eye patch. This character, interesting though it may be, is of limited practical use. The number of setae on the retinaculum is in all adults definitely two; doubt exists in some immatures, where the two setae differ developmentally. The wart on ant₃ is in the Greek material weakly trilobed, but this can also occur in material of typical *alpinus* (Fig. 46 b). In all other characters, notably the distinct dental chaetotaxy, the Greek material resembles *alpinus*, and I consider it most appropriate to evaluate the single difference in the retinaculum as a subspecific one.

After its description from Switzerland and Austria, *alpinus* was recorded from the Tatra (Nosek, 1969), Bulgaria (Rusek, 1965), and India (Choudhuri & Roy, 1972). The record from India needs confirmation.

Stenognathellus cassagnai Yosii, 1966 (Fig. 46 c)

S. denisi Cassagnau, 1953; Ellis, 1974.

Material: sample 27: 1 ♀; 36: 1 juv.; 45: 2 ♂.

Discussion. Dr. J.-M. Betsch, upon inspecting my only female from Rhodes, drew my attention to some distinctions with respect to true *denisi*: the middorsal seta on abd₆, which is deeply bifurcated in *denisi*, is simple in *cassagnai*. More-

over the dens has two latero-distal setae (anterior to the distal whorl) in *denisi*, but only one in *cassagnai* (Fig. 46 c).

The Greek material is in good agreement with the species of Yosii, described from Nepal, except that the eye patch is well pigmented in the Greek material, and ant₃ is perhaps slightly less inflated. The appearance of this inflation depends strongly however, on the observation angle. Until now, the species had not been found again since its description.

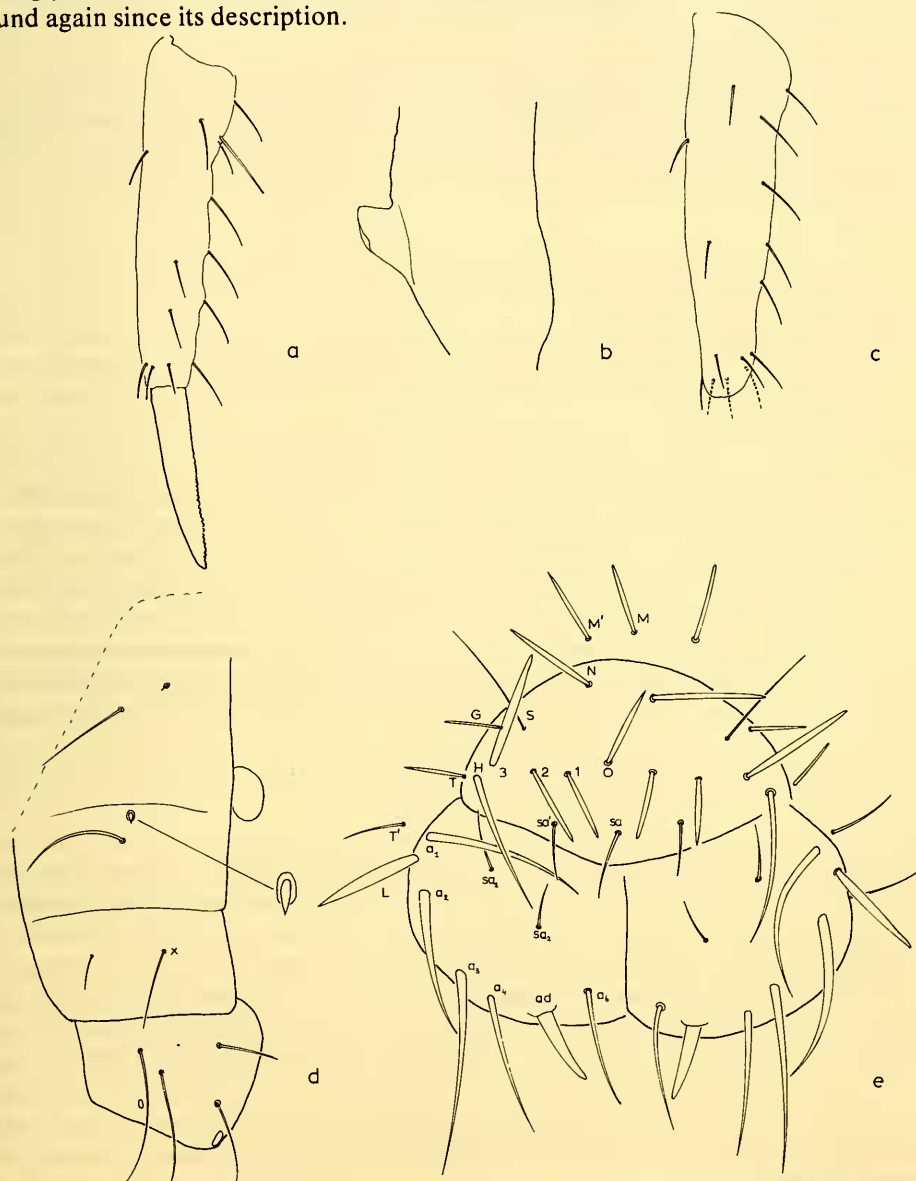


Fig. 46. *Sminthurinus alpinus bisetosus* n. ssp. a, mucrodens; b, wart on ant., *Stenognathellus cassagnai* Yosii. c, dens. *Sminthurus nigromaculatus* Tullberg. d, subcoxae 1 and 2 and coxa of P₃; the seta marked x on subcoxa 2 is absent in *S. viridis*. *Ptenothrix italica* Dallai. e, female postabdomen

***Sminthurus multipunctatus* Schäffer, 1896**

Material: sample 15: 1 ♀.

This species has been recorded from southern and eastern Europe.

***Sminthurus flaviceps* Tullberg, 1871**

Material: sample 27: 1 juv.; 35: 1 juv.; 38: 3 juv.

This species, described from Sweden, has been recorded from Germany and most southern and eastern European countries. The record from the Netherlands (Buitendijk, 1941) is erroneous, as I was able to verify through examination of the original material.

***Sminthurus nigromaculatus* Tullberg, 1871 (Fig. 46 d)**

Material: sample 15: 23 juv.; 21: 1 juv. (cf.); 26: 1 juv. (cf.); 35: 1 ♀; 36: 1 ♂ and 3 juv.; 38: 6 juv. + 23 specimens, presumably also immature, in alcohol; 46: 1 ♂.

Discussion. Many authors have been reluctant to accept *nigromaculatus* as a good species, because of the minimal set of characters available to distinguish it from *viridis* (Linnaeus, 1758): a preference for drier habitats, for pollen as food (little or no plant epidermis is consumed), and the presence of two (sometimes one) dark spots on the postabdomen. I think that I have now found a good morphological character. Subcoxa 2 of P_3 in *viridis* has one rather thin hair; *nigromaculatus* has the same, but also anteriorly another stouter hair (Fig. 46 d). The latter is found in *nigromaculatus* in the Netherlands and Rhodes (my separation of *viridis* and *nigromaculatus* in material from Rhodes is thus corroborated) and in the present *nigromaculatus* from Crete. The character holds for larger immatures, but very young immatures of *nigromaculatus*, which usually already have the spots on the postabdomen, show only the single hair of *viridis* — but in such specimens the number of setae on the coxa of P_3 is 2, instead of 4, and the setae on the dens are fewer in number.

Comparison of the situation in *S. nigromaculatus* with that in other Symphypleona (*Allacma*, *Neosminthurus*, *Lipothrix* of the same subfamily, *Bourletiella* and *Deuterosminthurus* of the Bourletiellinae, and even *Dicyrtoma* of the Dicyrtomidae) shows that in the others subcoxa 2 of P_3 has only one seta, which, to judge from its appearance and location, is homologous with the single seta in *S. viridis*. I therefore consider the possession of an extra seta by *S. nigromaculatus* to be an apomorphous character. It is a bit surprising, however, that this character is also present in *Caprainea echinata* (Stach, 1930) and *C. marginata* (Schött, 1893).

Within the genus *Sminthurus* s. str., I found that *S. guthriei* Stach, 1920, shows the plesiomorphous state, but *S. multipunctatus* Schäffer, 1896, and *S. maculatus* Tömösvary, two species which are very close to *nigromaculatus*, possess the apomorphous character state.

The stability of the chaetotaxy in the coxal region of P_3 is great. Both *viridis* and *nigromaculatus* are very common in the Dutch fauna and generally in Europe.

Among the large material available I found only one aberrant specimen, an adult ♀ of *nigromaculatus* from the Netherlands in which the extra seta was absent on one side.

The specimens from Crete are all intensely mottled with blue pigment all over the body. This also applies to the immatures, which excludes the possibility of a gradual darkening of adult specimens by subcutaneous accumulation of waste products. In general appearance they have no resemblance to the *nigromaculatus* from Rhodes.

It thus seems that *viridis* and *nigromaculatus* are two well-separated species which must have evolved in a comparatively remote past. *S. viridis*, the most primitive of the two, has not evolved any further and remained monomorphous. *S. nigromaculatus*, on the contrary, is in a state of evolutionary radiation and the species comprises a number of forms, many of which doubtless have not yet reached the level of species.

Only the refined methods of beta-taxonomical approach can clarify this complex. Its recognizable members are "*maculatus*", the pale, two-spotted western European *nigromaculatus*, the dark marbled *nigromaculatus* from southern Europe, and the single-spotted *nigromaculatus* described from Rhodes.

***Caprainea echinata* (Stach, 1930)**

Material: sample 19: 1 juv.; 25: 4 juv.; 29: 4 juv.; 31: 1 ♀ and 1 juv.; 44: 3 juv.

This Mediterranean species has already been mentioned from Rhodes.

***Neosminthurus natalicus* Ellis, 1974**

Material: sample 24: 2 juv.; 25: 2 juv.; 35: 1 ♂ and 4 juv.; 44: 4 juv.

This apparently Mediterranean species was previously known from Ibiza and Rhodes.

DICYRTOMIDAE

***Dicyrtoma* (*Dicyrtoma*) *melitensis* Stach, 1957**

Material: sample 46: 1 immature specimen.

Discussion. The identification is made with some reservation, because the ungicular filament of P₁ of both feet is distinctly knobbed. The dental chaetotaxy, however, points to *melitensis*. The species has been described from Malta and was recorded from Stromboli (Altner, 1961), Sardinia (Parisi, 1969), and the small Italian island of Pianosa (Dallai, 1969b).

***Dicyrtomina* (*Calvatomina*) cf. *articulata* Ellis, 1974**

Material: sample 27: 6 juv.

The material unequivocally belongs to the subgenus *Calvatomina* Yosii, 1966, but is too young to be attributed with certainty to *articulata*.

***Ptenothrix italica* Dallai, 1973 (Fig. 46 e)**

Material: sample 31: 1 ♀.

The single specimen is in good agreement with Dallai's description of *italica*, from southern Italy. Since Dallai did not have females, I add a drawing of the female postabdomen. The anal appendages are comparatively thick (Fig. 46 e). Although *Ptenothrix cavicola* Cassagnau & Delamare Deboutteville, 1955, described from the Lebanon, is very close to *italica*, on the basis of the few distinctive characters available (pigmentation of ant₂, presence of two instead of three teeth on lateral carina of unguis) the Cretan specimen is to be attributed to the western species.

REFERENCES

- Altner, H., 1961. Über die Collembolenfauna des Mittelmeergebietes. I. Collembolen von der Insel Stromboli. — *Revue suisse Zool.* 68 (28): 265—272.
- Börner, C., 1902. Das Genus *Tullbergia* Lubbock (Vorläufige Mittheilung). — *Zool. Anz.* 26 (689): 123—131.
- Bonet, F., 1944. Tullberginos de Mexico (Collembola). — *Revta Soc. mex. Hist. nat.* 5 (1/2): 51—72.
- Bourgeois, A., & P. Cassagnau, 1972. La différenciation du type Ceratophysellien chez les Collembolles Hypogastruridae. — *Nouv. Revue Ent.* 2 (3): 271—291.
- Buitendijk, A. M., 1941. Collembola. — *Fauna Ned.* 11: 1—99.
- Cassagnau, P., 1963. Les Collembolles d'Afrique du Nord avec une étude de quelques espèces du Nord-Constantinois. — *Bull. Soc. Hist. nat. Toulouse* 98 (1/2): 197—206.
- , 1964. Faune française des Collembolles. XIII. Sur les Collembolles épigés de la vallée d'Aure (Hautes-Pyrénées) et sur quelques espèces nouvelles du Sud-Ouest et des Pyrénées. — *Bull. Soc. Hist. nat. Toulouse* 99 (3/4): 463—483.
- , 1971a. Les différents types d'écomorphose chez les collembolles Isotomidae. — *Revue Ecol. Biol. Sol* 8 (1): 55—57.
- , 1971b. Les structures nucléaires chez les Collembolles Neanuridae dans le cadre des phénomènes d'endomitose et de polyténie. — *Revue Ecol. Biol. Sol* 8 (1): 155—157.
- , 1973. Sur un nouveau genre de Collembolles récolté en Grèce continentale et à Corfu. — *Biology gallo-hellenica* 5 (1): 65—75.
- , 1974. Chétotaxie et phylogénie chez les Collembolles Poduromorphes. — *Pedobiologia* 14 (2/5): 300—312.
- Cassagnau, P., & C. Delamare Deboutteville, 1955. Mission Henri Coiffait au Liban (1951). 3. Collembolles. — *Archs Zool. exp. gén.* 91 (4): 365—395.
- Cassagnau, P., & O. Rouquet, 1962. Les Collembolles édaphiques du jardin botanique de Toulouse. Essai de biocénétique dynamique. — *Pedobiologia* 2 (1): 15—40.
- Choudhuri, D. K., & S. Roy, 1972. An ecological study on Collembola of West Bengal (India). — *Rec. Zool. Survey India* 66 (1/4): 81—101.
- Christiansen, K., 1958. The Collembola of Lebanon and Western Syria. Part II. Families Cyphoderidae and Oncopoduridae. — *Psyche, Cambr.* 64 (3): 77—89.
- , 1959. The Collembola of Lebanon and Western Syria. Part III. Family Isotomidae. — *Psyche, Cambr.* 65 (2/3): 59—80.
- , 1964. A revision of the Nearctic members of the genus *Tomocerus* (Collembola Entomobryidae). — *Revue Ecol. Biol. Sol* 1 (4): 639—678.
- Cvijović, M., 1972. Fauna Entomobryidae i Sminthuridae (Collembola) na sinjskom, livanjskom, glamočkom i kupreškom polju. — *Glasn. zemalj. Mus. Bosni Herceg. [n.s.]* 10: 79—101.
- Dallai, R., 1969a. Ricerche sui Collemboli. V. l'Isola di Montecristo. — *Redia* 51: 229—250.
- , 1969b. Ricerche sui Collemboli. VI. Le isole di Capraia e di Pianosa. — *Redia* 51: 277—304.
- , 1971. Ricerche sui Collemboli. XV. I Monti Reatini ed alcuni rilievi Abruzzesi. — *Lav. Soc. ital. Biogeografia [n.s.]* 2: 323—378, pls. 1—6.

- , 1973. Ricerche sui Collemboli. XVII. Le isole Eolie. — Lav. Soc. ital. Biogeografia [n.s.] 3: 481—590, pls. 1—12.
- Djanaschvili, R. A., 1971a. Hypogastruridae (Collembola) devoid of eyes and postantennal organ from the Transcaucasian caves. I. — Zool. Zhurn. 50 (6): 666—676.
- , 1971b. Hypogastruridae (Collembola) devoid of eyes and postantennal organ from the Transcaucasian caves. II. — Zool. Zhurn. 50 (8): 1191—1199.
- Dunger, W., 1966. Zur Kenntnis von *Neanura tetraphthalma* (Stach) (Collembola; Apterygota). — Abh. Ber. NaturkMus. Görlitz 41 (4): 1—11.
- , 1974. Neue und bemerkenswerte Collembolenarten der Familie Neanuridae. — Abh. Ber. NaturkMus. Görlitz 48 (5): 1—20.
- Ellis, W. N., 1966. On *Orchesella balcanica* Stach, 1960, and *Seira pillichii graeca* n. ssp., from Greece (Collembola, Entomobryidae). — Ent. Ber., Amst. 26 (8): 142—147.
- , 1970. *Proisotoma filifera* Denis in Holland, with a note on its classification (Collembola, Isotomidae). — Ent. Ber., Amst. 30 (1): 18—24.
- , 1974. The spring fauna of Collembola (Insecta) from Rhodos, with description of some new taxa. — Beaufortia 22 (292): 105—152.
- Gama, M. M. da, 1961. Nouvelle contribution pour l'étude des Collemboles du Portugal Continental. — Mems Estud. Mus. zool. Univ. Coimbra 269: 1—43.
- , 1963. Monografia do género *Isotomodes* (Insecta, Collembola). — Mems Estud. Mus. zool. Univ. Coimbra 284: 1—44.
- , 1964. Collêmbolos de Portugal Continental: 1—252 (Thesis, Coimbra).
- , 1966. Notes taxonomiques sur quelques espèces de Collemboles. — Mems Estud. Mus. zool. Univ. Coimbra 295: 1—21.
- , 1969. Notes taxonomiques et lignées généalogiques de quarante deux espèces et sous-espèces du genre *Xenylla* (Insecta: Collembola). — Mems Estud. Mus. zool. Univ. Coimbra 308: 1—61.
- , 1973. Systématique évolutive des Pseudosinella. IX. (Insecta: Collembola). — Revue suisse Zool. 80 (1): 45—63.
- Giard, A., 1895. [Lettre à Lataste]. — Act. Soc. scient. Chili 4 (4): ccxvii—ccxviii.
- , 1896. Sur le facies paléarctique des Thysanoures du sud de l'Amérique méridionale. — Act. Soc. scient. Chili 5 (4): cxxxi—cxxxii.
- Gisin, H., 1944. Hilfstabellen zum Bestimmen der holarktischen Collembolen. — Verhandl. naturf. Ges. Basel 55: 1—130.
- , 1960. Collembolenfauna Europas: 1—312 (Mus. Hist. nat., Genève).
- , 1962. Sur la faune européenne des Collemboles IV. — Revue suisse Zool. 69 (1): 1—23.
- , 1963a. Sieben neue Arten von Collembolen aus Bosnien und Wiederbeschreibung von *Onychiurus serratotuberculatus* Stach. — Godišnjak biol. Inst. Saraj. 14: 3—13.
- , 1963b. Collemboles cavernicoles du Jura méridional et des chaînes subalpines dauphinoises. — Annls Spéleol. 18 (3): 271—286.
- , 1965. Nouvelles notes taxonomiques sur les *Lepidocyrtus*. — Revue Ecol. Biol. Sol 2 (4): 519—524.
- Gisin, H., & M. M. da Gama, 1962. Les *Seira* des environs de Genève. — Revue suisse Zool. 69 (37): 785—800.
- Goto, H. E., 1953. Notes on the Collembola of the British Isles. — J. Soc. brit. Ent. 4 (8): 177—182.
- , 1972. Some observations on the biology and taxonomy of *Proisotoma stachi* Goto, 1957 (Insecta, Collembola: Isotomidae). — J. nat. Hist. 6 (2): 195—202.
- Grinbergs, A., 1968. Über die Collembolen der Sowjetunion. III. *Proisotoma (Dimorphiella) muriphila* n. subgen., n. sp., aus Novosibirsk. — Opusc. ent. 33 (1/2): 139—142.
- , 1975. Umänderung des Untergattungsnamens *Dimorphiella* auf *Dimorphotoma*. — Ent. Ber., Amst. 35 (7): 101.
- Grow, A. B., & K. Christiansen, 1974. Chaetotaxy in Nearctic *Friesea* (Collembola Neanurinae) with notes on taxonomic use of chaetotaxy. — Revue Ecol. Biol. Sol 11 (3): 377—396.
- Handschin, E., 1929. Urinsekten oder Apterygota (Protura, Collembola, Diplura und Thysanura). — Tierwelt Dtl. 16: i—vi, 1—150.
- Haybach, G., 1960. Beitrag zur Collembolenfauna Österreichs. Drei neue *Onychiurus*-Arten aus der Gruppe *armatus*. — Verh. zool.-bot. Ges. Wien 100: 69—73.

- Hepburn, H. R., & J. P. Woodring, 1964. A new species of *Folsomides* (Collembola: Entomobryidae) from Louisiana. — Ent. News 75 (3): 71—72.
- Hüther, W., 1961. Ökologische Untersuchungen über die Fauna pfälzischer Weinbergsböden mit besonderer Berücksichtigung der Collembolen und Milben. — Zool. Jb., Syst. 89: 243—368.
- , 1970. Über einige Collembolen von den Kanarischen Inseln. — Comment. biol. 31 (10): 1—11.
- Izarra, D. C. de, 1972. Fauna colemologica de Isla Victoria (provincia de Neuquen, Argentina). III. Familias Isotomidae y Entomobryidae. — Physis B. Aires 31 (83): 373—382.
- Jacquemart, S., 1973. Contribution à l'étude des milieux arides (II). A propos d'un Collembole nouveau de Jordanie: *Seira petrae* n. sp. — Bull. Inst. r. Sci. nat. Belg. 49 (1): 1—16, pl. 1.
- Joose, E. N. G., & E. Velkamp, 1970. Some aspects of growth, moulting and reproduction in five species of surface dwelling collembola. — Neth. J. Zool. 20 (3): 315—328.
- Kosarov, G., & I. Zonev, 1966. Collembola aus den Kulturfleichen Thrakiens. — Fauna Thrakia 3: 5—36.
- Lawrence, P. N., 1970. The rediscovery of *Neanura hystrix* Bagnall (Collembola, Neanuridae). — Entomologist's Gaz. 21 (2): 150—154.
- , 1973. The species of *Folsomia* Willem, 1902 (Collembola) described by Bagnall. — Entomologist's Gaz. 24 (4): 349—361.
- Loksa, I., & J. Bogojević, 1970. Einige interessante Collembolen-Arten aus der Sandwüste von Deliblat, Jugoslawien. — Opusc. zool. Bpest 10 (1): 125—142.
- Martynova, E. F., 1964. Order Podura (Collembola). — Opred. Faune SSR 84: 42—101. (English Translation prepared by the Israel Program for Scientific Translation, in 1967.)
- Martynova, E. F., V. G. Chelnokov, & Z. Rasulova, 1974. Species of the genus *Heieromurus* Wankel, 1860 (Collembola, Entomobryidae s.l.) in the USSR fauna. — Vest. Zool. 1974 (2): 67—71.
- Massoud, Z., 1963. Révision du genre *Pseudachorudina* Stach (Collembola Poduromorphes). — Revue fr. Ent. 30 (3): 193—204.
- , 1967. Monographie des Neanuridae, Collembola Poduromorphes à pièces buccales modifiées. — Biol. Am. aust. 3: 7—399.
- Massoud, Z., & C. Delamare Deboutteville, 1964. Contribution à l'étude du genre *Sphaeridia* (Linnaeus, 1912). — Revue Ecol. Biol. Sol 1 (1): 85—116.
- Massoud, Z., & E. Rapoport, 1968. Collembola isotomides d'Amérique du Sud et de l'Antarctide. — Biol. Am. aust. 4: 307—337.
- Murphy, D. H., 1960. Some records and redescrptions of British Collembola. Part I. Arthropleona, with a description of *Micranurida conjuncta* sp. n. — Proc. R. ent. Soc. Lond. [B] 29 (3/4): 46—55.
- Nosek, J., 1969. The investigation of the apterygotan fauna of the Low Tatras. — Acta Univ. carol., Biol. 1967 (5/6): 349—528, pls. 1—23.
- Palissa, A., & J. Živadinović, 1974. Beiträge zur Collembolenfauna Jugoslawiens (I). — Dt. ent. Z. [n.F.] 21 (4/5): 309—315.
- Parisi, V., 1969. Observations sur quelques collembola des îles Tavolara et Molara. — Rapp. P.-v. Réunion. Commn int. Explor. scient. Mer méditerran. 19 (5): 817—819.
- Petersen, H., 1965. The Collembola of the Hansted Reserve, Thy, North Jutland. Taxonomy, Ecology. — Ent. Meddr 30 (4): 313—395.
- Poinsot, N., 1972. Étude systématique et écologique des Collembola Isotomidae de Provence. — Annls.Soc. ent. Fr. [n.s.] 8 (3): 669—691.
- Rapoport, E., & I. Rubio, 1963. Fauna colemologica de Chile. — Investnes zool. chil. 9: 95—124.
- Rusek, J., 1959. Nové nálezy druhů rodu *Onychiurus* (Collembola) v ČSR. — Sb. Klubu přír. Brně 31: 95.
- , 1965. Beitrag zur Collembolen-fauna Bulgariens. — Acta Univ. carol., Biol. 1965 (2): 179—191.
- , 1967. Beitrag zur Kenntnis der Collembola (Apterygota) Chinas. — Acta ent. bohemoslovaca 64 (3): 184—194.
- , 1971. Zur Taxonomie der *Tullbergia* (*Mesaphorura*) *krausbaueri* (Börner) und ihrer Verwandten (Collembola). — Acta ent. bohemoslovaca 68 (3): 188—206.
- , 1972. *Coloburella linnaniemii* (Denis) and *Coloburella cassagnai* sp. n. (Collembola). — Věst. čsl. Spol. zool. 36 (4): 275—279.

- , 1973a. Neue Collembolen von den Überschwemmungswiesen Süd-Mährens. — Věst. čsl. Spol. zool. 37 (3): 183—194.
- , 1973b. Zur Collembolenfauna (Apterygota) der Praealpe Venete. — Boll. Mus. Civ. Stor. nat. Venezia 24: 71—95.
- , 1974. Zur Taxonomie der Tullbergiinae (Apterygota: Collembola). — Věst. čsl. Spol. zool. 38 (1): 61—70.
- Salmon, J. T., 1962. New Collembola from 83 deg. South in Antarctica. — Trans. R. Soc. N.Z. [Zool.] 2 (18): 147—152.
- , 1964-65. An index to the Collembola. — Bull. R. Soc. N. Zeal. 7 (1—3): 1—651.
- Selga, D., 1962a. Tres especies nuevas de colémbolos del Puerto de Navacerrada (Guadarrama). — Publ. Inst. Biol. apl. Barcelona 33: 33—41.
- , 1962b. *Proisotoma* (Collembola) de los suelos del Guadarrama con descripción de una nueva especie del mismo género. — Boln R. Soc. esp. Hist. nat. [B] 60: 69—76.
- , 1963. Cuatro especies nuevas de Colémbolos de la Sierra de Guadarrama. — Publ. Inst. Biol. apl. Barcelona 35: 83—96.
- , 1966. Descripción y comentarios ecológicos de cuatro nuevas especies de colémbolos. — Boln R. Soc. esp. Hist. nat. [B] 64: 145—160.
- , 1973. Catálogo de los Colémbolos de la Península Ibérica. — Graellsia 26: 133—284.
- South, A., 1961. The taxonomy of the British species of *Entomobrya* (Collembola). — Trans. R. ent. Soc. Lond. 113 (13): 387—416.
- Stach, J., 1947. The apterygotan fauna of Poland in relation to the world-fauna of this group of insects. Family: Isotomidae. — Acta monogr. Mus. Hist. nat. 1947: 1—488, pls. 1—53.
- Stomp, N., 1968. *Tetracanthella hygropetrica luxemburgensis* n. ssp. de la région du „Grès de Luxembourg” (Insecta, Collembola, Isotomidae). — Bull. Mus. natn. Hist. nat. [2] 40 (4): 734—741.
- , 1971. Contribution à l'étude des *Pseudosinella* endogés. Espèces européennes de *Pseudosinella* à 5 + 5 yeux. (Collembola, Entomobryidae). — Revue Ecol. Biol. Sol 8 (1): 173—188.
- , 1972. Deux nouvelles espèces de *Pseudosinella* endogés d'Europe. (Collembola, Entomobryidae). — Revue suisse Zool. 79 (1): 279—286.
- Szeptycki, A., 1967. Fauna of the springtails (Collembola) of the Ojców National Park in Poland. — Acta zool. cracov. 12 (10): 219—280, pls. 17—22.
- Thibaud, J. M., 1967. Description d'une espèce nouvelle de Collembola *Acherontiella cassagnai* n. sp. — Anns Spéléol. 22 (2): 393—400.
- Yosii, R., 1960. Studies on the Collembolan genus *Hypogastrura*. — Am. Midl. Nat. 64 (2): 257—281.
- , 1965. On some Collembola of Japan and adjacent countries. — Contr. biol. Lab. Kyoto Univ. 19: 1—71.
- , 1966a. Collembola of Himalaya. — Coll. Arts Sci. Chiba Univ., Nat. Sci. Ser. 4 (4): 461—531.
- , 1966b. On some Collembola of Afghanistan, India and Ceylon, collected by the Kuphe-expedition, 1960. — Res. Kyoto Univ. sc. Exp. Karakoram Hindukush 1955, 8: 333—405.
- , 1972. Collembola from the alpine region of Mt. Poroshi in the Hidaka Mountains, Hokkaido. — Mem. natn. Sci. Mus. 5: 75—99.
- Živadinović, J., 1972. Species of Collembola (fam. Poduridae, Onychiuridae and Isotomidae) as members of the karstic polja in the dinaric massives and the dynamics of their population. — Gođšnjak srp. Akad. Nauk 25: 175—226, tab. 1—3.

INDEX

<i>Acheroxenylla</i> nov. gen.	237-238	<i>marchicus</i> Frenzel	285
<i>affinis</i> Börner	225-227	<i>maritima</i> Tullberg	244
<i>afurcata</i> Denis	259-266	<i>maroccanus</i> Delamare Deboutteville	306, 307
<i>albertinae</i> n. sp.	291, 292-296	<i>melitensis</i> Stach	321
<i>albida</i> Stach	311	<i>minitaurus</i> n. sp.	271, 272-274, 275
<i>albinus</i> Nicolet	306	<i>minor</i> Schäffer	301
<i>americanus</i> Denis	284	<i>minuta</i> Tullberg	292
<i>anthrenoidea</i> n. sp.	275, 278-280	<i>mucronata</i> n. sp.	271, 272-274
<i>armata</i> Nicolet	245	<i>multifasciata</i> Tullberg	317
<i>articulata</i> Ellis	321	<i>multipunctatus</i> Schäffer	320
<i>asigillata</i> Börner	267-269	<i>muscorum</i> Nicolet	316
<i>aureus</i> Lubbock	318	<i>nanus</i> Ellis	283, 285
<i>bisetosus</i> n. ssp.	318, 319	<i>natalicus</i> Ellis	321
<i>cassagnai</i> Yosii	318-319	<i>navacerradensis</i> Selga	284-285
<i>crassicornis</i> Shoebotham	303, 305	<i>nigromaculatus</i> Tullberg	319, 320-321
<i>cretensis</i> n. sp. (<i>Acheroxenylla</i>)	236, 238-242	<i>nitidus</i> Templeton	311
<i>cretensis</i> n. sp. (<i>Neanura</i>)	277-278	<i>notabilis</i> Schäffer	301, 302
<i>cretensis</i> n. sp. (<i>Troglopedetes</i>)	306-310	<i>octopunctata</i> Börner	311
<i>critica</i> n. sp.	230-231	<i>olivacea</i> Tullberg	302, 303
<i>debilis</i> Cassagnau	289, 290-292	<i>orientalis</i> n. ssp.	252, 253-255, 256
<i>decipiens</i> Steiner	266-267	<i>ossica</i> Cassagnau	266-267
<i>dubius</i> Krausbauer	269	<i>palustris</i> Müller	303
<i>echinata</i> Stach	321	<i>paprivata</i> n. sp.	308, 312, 313
<i>flaviceps</i> Tullberg	320	<i>parvula</i> Schäffer	259
<i>gibbosa</i> Bagnall	245	<i>parvulus</i> Stach	282-284
<i>gisini</i> Strenzke	243, 245, 247-249	<i>ponticus</i> Stach	286-287
<i>graeca</i> Ellis	314-315	<i>porcellus</i> n. sp.	295, 296-301, 302
<i>granulata</i> Cassagnau & Delamare	274-276, 278	<i>prolatus</i> Gisin	232-233
<i>handschini</i> Stach	316	<i>pseudoghidinii</i> Dallai	233, 235, 236
<i>hygropetrica</i> Cassagnau	282, 283	<i>pumilis</i> Krausbauer	317
<i>imparipunctata</i> Gisin	311	<i>rhodia</i> Ellis	242-244
<i>incertus</i> Börner	317	<i>schoetti</i> Von Dalla Torre	292, 295
<i>italica</i> Rusek (<i>Mesaphorura</i>)	231	<i>serbicus</i> Denis	313, 314
<i>italica</i> Dallai (<i>Ptenothrix</i>)	319, 322	<i>sexoculatus</i> Brown	310-311
<i>krausbaueri</i> Börner	231	<i>stachianus</i> Bagnall	235
<i>ksenemani</i> Stach	283, 285-286	<i>succinea</i> Gisin	244-245
<i>lamelligerus</i> Börner	304-306	<i>tethyca</i> n. sp.	246, 248, 249-251, 253
<i>libanensis</i> Cassagnau & Delamare	269-272	<i>thermophilus</i> Axelson	286
<i>Deboutteville</i>	269-272	<i>tricuspidis</i> Börner	228
<i>lignorum</i> O. Fabricius	312-313	<i>triglenus</i> n. sp.	287-288, 290
<i>linnaniemii</i> Denis	282	<i>trisetosus</i> Denis	282
<i>longiseta</i> Caroli	279, 280-281	<i>vaillanti</i> Murphy	301
<i>major</i> Moniez	310	<i>vernalis</i> Carl	253
<i>malmgreni</i> Tullberg	317	<i>viridis</i> Bourlet	303
<i>manubrialis</i> Tullberg	249	<i>xenonis</i> n. sp.	234, 235, 237